

حمل الآن

مجاناً وحصرياً

المراجعة رقم (1)

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Atomic emission spectra (Line spectra)

- 20** The line spectrum of an element is characteristic, as no two elements can have the same
- (a) atomic number.
 - (b) atomic mass.
 - (c) physical state.
 - (d) physical properties.
- 21** What is the scientific contribution which led to concluding the electron configurations of the elements ?
- (a) The conclusion that the atom is electrically neutral.
 - (b) Analyzing the light emitted from the excited atoms.
 - (c) Thomson's atomic model.
 - (d) Rutherford's atomic model.
- 22** All the following are correct, except that
- (a) the line spectrum of hydrogen atom is formed of four inseparable lines.
 - (b) the electrons are negatively charged.
 - (c) Bohr's atomic model introduced the concept of quantum to determine the energy of the electrons in the energy levels.
 - (d) in case of not gaining or losing energy, the atom is described to be stable.

Bohr's atomic model

- 23** According to Bohr's theory, the orbit in which the electron revolves can be determined through
- (a) the electron mass.
 - (b) the electron energy.
 - (c) the electron charge.
 - (d) the nucleus charge.
- 24** Through studying the line spectrum of an atom, it is possible to know
- (a) the isotopes of the element atom.
 - (b) the energy levels in the atom.
 - (c) the composition of the nucleus of the atom.
 - (d) the number of the neutrons inside the nucleus of the atom.
- 25** When an electron absorbs a quantum, it will transfer to
- (a) all higher energy levels.
 - (b) all lower energy levels.
 - (c) a higher energy level that matches the absorbed quantum.
 - (d) a lower energy level that matches the absorbed quantum.

- 26** When the electrons of an excited atom return to their original energy levels, this results in the emission of
- (a) α -particles. (b) β -particles.
(c) energy in the form of line spectra. (d) γ -rays.
- 27** Each of the following is correct for the electron, except that
- (a) the electron in the lower energy level absorbs energy to travel to a higher energy level.
(b) the amount of energy which is emitted from the excited electron equals the amount of energy which is absorbed by the same electron to reach the stable state.
(c) the electron in the first energy level can be at infinite distance from the nucleus.
(d) the electron can absorb different quanta of energy.
- 28** The excited electron tends to
- (a) absorb energy to return to its ground state.
(b) produce light with a definite wavelength and energy.
(c) stay in its unstable state.
(d) settle in a higher energy level.
- 29** On comparing the position of an electron in its ground state, with its position in the excited state, it is
- (a) in the second energy level. (b) in the nucleus.
(c) closer to the nucleus. (d) farther from the nucleus.
- 30** The probability of an electron to exist in the region between two orbits according to Bohr equals
- (a) 100% (b) 50% (c) 10% (d) 0%
- 31** Which of the following supports the concept of quantum in determining the energy of the electrons ?
- (a) The emission spectrum of hydrogen atom.
(b) The deflection of the electrons when found in an electric field.
(c) The deflection of some α -particles upon collision with gold foil.
(d) The penetration of most of α -particles upon collision with gold foil.
- 32** According to Bohr's atomic model, to travel from the first level K to the fourth level N, the electron
- (a) acquires a quantum. (b) loses a quantum.
(c) acquires 4 quanta. (d) loses 4 quanta.

33 To obtain the visible spectrum of hydrogen atom for an electron that has been excited to the energy level M, this electron must

- (a) lose a quantum of energy less than that it has gained.
- (b) gain a quantum of energy greater than that it has gained.
- (c) lose the quantum of energy it has already gained.
- (d) gain quantum of energy.

34 The visible line spectrum of hydrogen atom arises as a result of the return of the excited electron from higher energy levels to the level

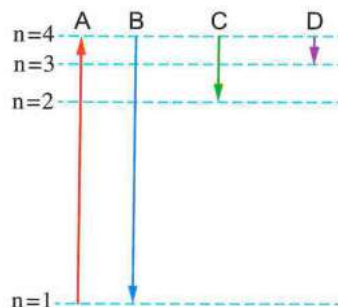
- (a) K
- (b) L
- (c) M
- (d) N

35 Which of the following transitions of the electron in hydrogen atom results in the emission of visible light ?

- (a) $(n = 5) \longrightarrow (n = 2)$.
- (b) $(n = 3) \longrightarrow (n = 1)$.
- (c) $(n = 1) \longrightarrow (n = 2)$.
- (d) $(n = 3) \longrightarrow (n = 4)$.

36 The opposite figure shows several travels of the electron of an excited hydrogen atom between different energy levels. Which of these travels produces a spectral line of hydrogen atom ?

- (a) A
- (b) B
- (c) C
- (d) D



37 The spectral lines of the atom of any element indicate

- (a) the number of electrons in the atom of this element.
- (b) the energy of the level where the electron is present.
- (c) the energy of the electron in the energy level.
- (d) the difference in energy between two energy levels.

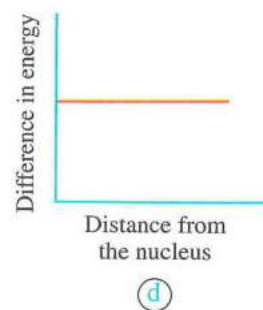
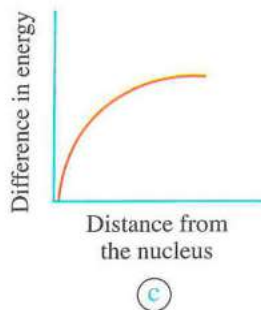
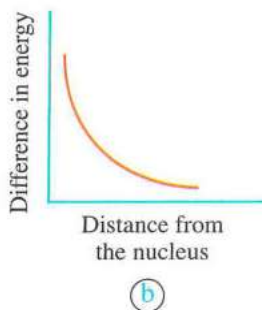
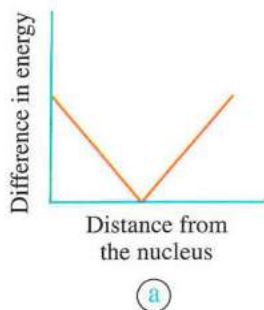
38 The radiation whose wavelength is 486 nm lies in the region of

- (a) infrared rays.
- (b) UV rays.
- (c) visible light.
- (d) infraviolet rays.

39 The electron in hydrogen atom which is excited to the fourth energy level

- (a) remains in the same new energy level.
- (b) returns to its ground state accompanied by visible spectrum only.
- (c) returns to its ground state in one jump or several successive jumps.
- (d) transfers to a higher energy level.

- 40 What is the chart which represents the relation between the difference in energy between two consecutive levels in an atom and the distance from the nucleus ?



- 41 Bohr's model is applied to

- (a) $_{11}\text{Na}^{10+}$ ion. (b) $_2\text{He}$ atom. (c) $_4\text{Be}^{2+}$ ion. (d) $_6\text{C}^{6+}$ ion.

- 42 Among the postulates of Bohr's atomic model is that

- (a) electrons can acquire any amount of energy.
 (b) it is impossible to determine the path of the electrons precisely.
 (c) the energies of the electrons in different energy levels are determined through the concept of quantum.
 (d) the electron has wave properties.

- 43 Which of the following statements is consistent with Bohr's postulates ?

- (a) Space regions between energy levels are occupied by electrons.
 (b) The electron moves in a planar circular path.
 (c) The electron is a negative particle with wave properties.
 (d) The electron revolves around the nucleus in all directions.

- 44 Bohr's atomic model differs from that of Rutherford, this difference is obvious in Bohr's postulate that the electron

- (a) produces a spectral line when it loses a quantum.
 (b) is a negatively charged particle.
 (c) does not produce a spectral line when it loses a quantum.
 (d) revolves around the nucleus in certain orbits.

Essay questions



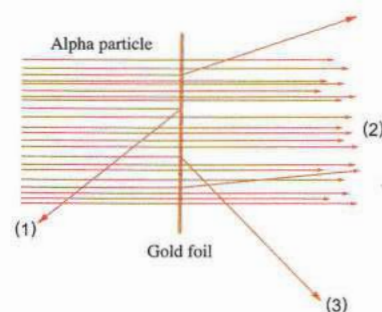
- 45 Give reason for :

- (1) The atom is electrically neutral.
 (2) Alpha rays are deviated when exposed to a magnetic or an electric field in a direction opposite to that of the electrons.

- (3) The metallic plate in Rutherford's experiment is lined with ZnS
- (4) Rutherford's model of atom resembles the solar system.
- (5) The electron does not fall into the nucleus despite the attraction forces between them.
- (6) The emission spectrum is known as line spectrum.
- (7) The line spectrum is a defining characteristic for each element.
- (8) The quantum of energy required for the travelling of an electron between different energy levels is not a constant quantity.
- (9) The incorrectness of Bohr's assumption that hydrogen atom is planar.

46 In the shown diagram which illustrates Rutherford's experiment :

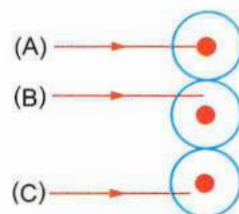
- (1) Why is ray (1) bounced back ?
- (2) What is the indication of :
 - (i) The penetration of ray (2) to the gold foil without deviation.
 - (ii) The deviation of ray (3).



47 The opposite figure shows Rutherford's experiment.

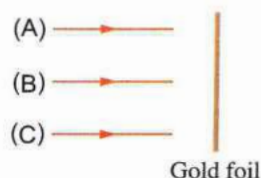
Which of alpha particles (A , B or C) will flash at the same position before placing the gold foil ?

Explain your answer.



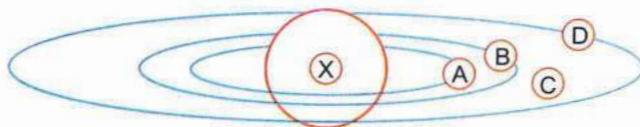
48 The opposite figure illustrates falling of three α -particles on a gold foil :

- Particle (A) : Moves towards the nucleus of the atom of gold.
- Particle (B) : Moves close to the nucleus of the atom of gold.
- Particle (C) : Moves in the space surrounding the nucleus of the atom of gold.



- (1) Complete the path of the three particles on the figure.
- (2) Show the importance of using a huge number of α -particles in this experiment.

49 In the opposite figure, **determine with explanation** the position(s) in which the electron cannot be present according to Bohr's atomic model.



50 In the light of your understanding for Bohr's atomic model.

Show the change which occurs in each of the energy and the position of an electron when it is excited.

- 51 The opposite table represents the probabilities of the emission spectrum of hydrogen atom.

Which of these probabilities represents the visible spectrum of hydrogen atom ?
Give reason.

Probability	Electron transfer	
	From (n)	To (n)
(A)	2, 3, 4, 5	1
(B)	3, 4, 5, 6	2
(C)	4, 5, 6, 7	3

- 52 The two shown figures represent the emission of the green light and the red light - with no particular order - as a result of the returning of an excited electron to its ground state in hydrogen atom.

Which of them represents the green light ?
Explain.

Absorbed energy

Figure (1)

Absorbed energy

Figure (2)

Higher – order questions

Answered in detail

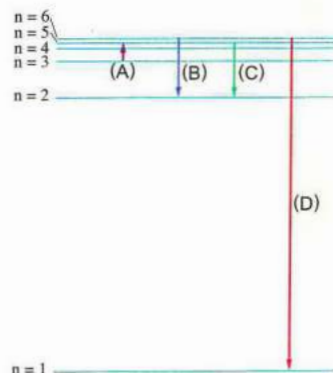
Choose the correct answer :

- 53 The visible line spectrum of hydrogen atom consists of four coloured lines. Which of them has the smallest frequency ?

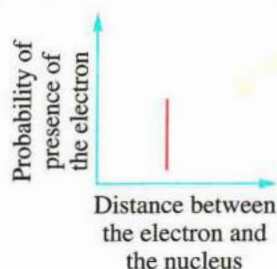
(a) The green. (b) The blue. (c) The red. (d) The violet.

- 54 The diagram shows several transitions of the electron of an excited hydrogen atom between different energy levels, by knowing that the energy (E) is inversely proportional to the wavelength (λ). Which of the transitions produces visible light with the shortest wavelength ?

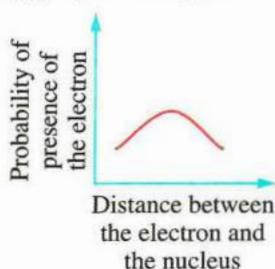
(a) (A). (b) (B).
(c) (C). (d) (D).



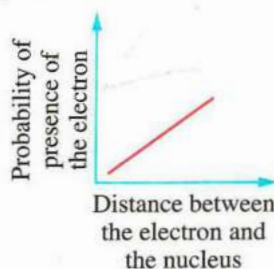
- 55 Which of the following graphical figures represents Bohr's concept of the orbit ?



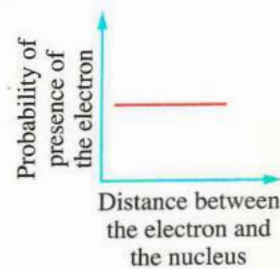
(a)



(b)



(c)



(d)

56 In an excited hydrogen atom, a photon of light with wavelength 486 nm is emitted when the electron transfers from the principal level ($n = 4$) to the principal level

- (a) $n = 1$ (b) $n = 2$ (c) $n = 3$ (d) $n = 5$

57 If the difference in energy between energy levels K and L equals ΔE_1 then the difference in energy ΔE_2 between energy levels O and P is

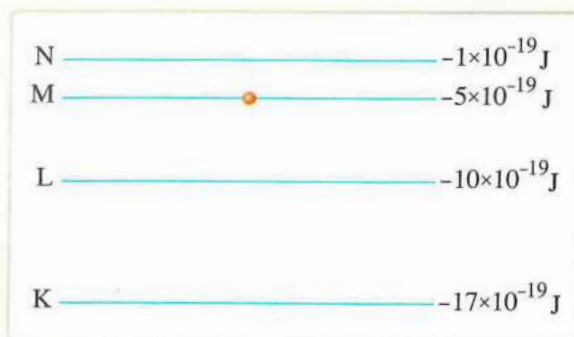
- (a) higher than ΔE_1 (b) lower than ΔE_1
(c) equal to ΔE_1 (d) approximately equal to ΔE_1

58 If an electron acquires an amount of energy equals 1.89 eV to transfer from energy level L to M, then to transfer from L to K, it may

- (a) lose an amount of energy equals 1.89 eV
(b) acquire an amount of energy equals 1.89 eV
(c) lose an amount of energy equals 10.2 eV
(d) acquire an amount of energy equals 10.2 eV

59 In the opposite figure, if an electron in the energy level M in a hypothetical atom acquires an amount of energy equals 4×10^{-19} J, then it

- (a) transfers to the level L
(b) transfers to the level K
(c) transfers to the level N
(d) remains in the level M



60 Two electrons (X) and (Y) :

- Electron (X) is found in the second energy level.
- Electron (Y) is found in the third energy level.

When electron (Y) gains a quantum of energy, it moves to the fourth level.

What happens when electron (X) gains the same quantum of energy ?

- (a) It remains in its level. (b) It moves to higher level.
(c) It moves to all the higher levels. (d) It moves to lower level.

Multiple choice questions (MCQ)



The modern atomic theory

- 1 Which of the following electronic transitions in hydrogen atom is accompanied by releasing the largest amount of energy ?
 - (a) From the orbit M to the orbit L and the position of this electron can be determined.
 - (b) From the orbit N to the orbit M and neither the position nor the speed of this electron can be determined precisely.
 - (c) From the orbit L to the orbit K and this electron has a dual nature.
 - (d) From the orbit L to the orbit K and the position and the speed of this electron can be determined precisely.

- 2 The dual nature of the electron means that it has
 - (a) a mass and a charge.
 - (b) a mass and a wave motion.
 - (c) a volume and a wave motion.
 - (d) a mass and a density.

- 3 Each of the following is among the properties of the electron, except that it
 - (a) is a material particle.
 - (b) has wave properties.
 - (c) loses energy when it transfers from one energy level to a higher level.
 - (d) is deflected by the effect of an electric field.

- 4 A drawback of Bohr's model that was fixed by the modern atomic theory is that
 - (a) the electron has a dual nature.
 - (b) the electron has a wave nature.
 - (c) the electron is a negatively charged material particle.
 - (d) the electron revolves around the nucleus in electron cloud.

- 5 The scientist who presumed that it is possible to determine both the speed and position of an electron together precisely is
 - (a) Heisenberg.
 - (b) Thomson.
 - (c) Bohr.
 - (d) Rutherford.

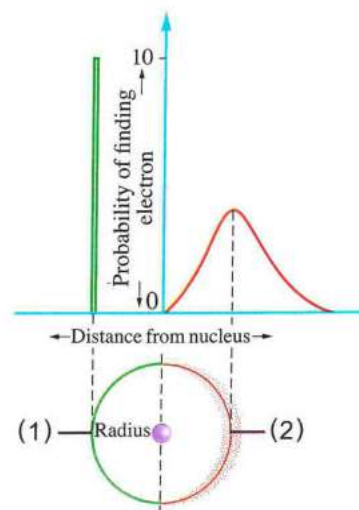
- 6 What is the name of the scientist who destroyed Bohr's belief that there are regions in the atom forbidden for the electrons ?
 - (a) Thomson.
 - (b) Heisenberg.
 - (c) Schrödinger.
 - (d) Rutherford.

- 7 Which of the following statements is a Heisenberg's modification to Bohr's atomic model ?
- It is impossible to determine the position and the speed of the electron together precisely.
 - Space regions between energy levels are not forbidden for the electrons.
 - The electron is a material particle with wave properties.
 - Both the speed and the position of the electron can be determined together precisely.
- 8 "The actual position of the last electron in iron atom and its speed in a certain moment cannot be precisely determined".
The previous statement is an application of
- Hund's rule.
 - Bohr's model.
 - uncertainty principle.
 - the dual nature of the electron.
- 9 According to the wave-mechanical theory,
- the electron has a mass as well as wave properties.
 - the electrons are found in the orbitals.
 - the nucleus is very small compared to the atom.
 - the electrons are negatively charged.
- 10 Applying the wave equation to the last electron in sodium atom $_{11}\text{Na}$ shows that
- its location can be determined precisely in the energy level M
 - it moves towards or away from the nucleus in the energy level M
 - its energy is lower than the energy of the electrons of the level K
 - it moves to the level L after losing a quantum of energy.
- 11 The modern atomic theory agrees with Rutherford's model on that
- the atom is not solid.
 - the electrons have wave properties.
 - it is impossible to determine the speed and the position of the electron together precisely.
 - there is a pattern according to which the electrons orbit the nucleus.

- 12 The shown diagrams illustrate two different perceptions of the movement of an electron around the nucleus.

To whom does each of these perceptions belong ?

Choices	(1)	(2)
(a)	Bohr	Schrödinger
(b)	Schrödinger	Bohr
(c)	Bohr	Rutherford
(d)	Rutherford	Schrödinger



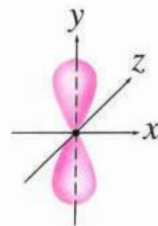
Quantum numbers

- 13 The maximum possible value of the principal quantum number (n) in the heaviest known atom in its ground state is
(a) 5 (b) 6 (c) 7 (d) 8
- 14 The maximum number of electrons which saturate the principal energy level (n) is given from the relation
(a) $2n$ (b) n^2 (c) $2n^2$ (d) $(2n)^2$
- 15 What is the quantum number whose value may never be zero or a fraction ?
(a) Principal. (b) Subsidiary. (c) Magnetic. (d) Spin.
- 16 The principal quantum number (n) of the electron of the sublevel $3s^1$ equals
(a) 0 (b) 1 (c) 2 (d) 3
- 17 The symbols s, p, d, f indicate
(a) principal energy levels.
(b) energy sublevels.
(c) the number of orbitals of the sublevel.
(d) the number of single electrons in the individual sublevel.
- 18 What is the symbol of the principal level which contains s, p and d sublevels only ?
(a) L (b) M (c) N (d) K
- 19 When ($n = 2$), then one of the possible values of (l) is
(a) -2 (b) 0 (c) $-\frac{1}{2}$ (d) 2
- 20 What is the quantum number whose value for an electron in the principal energy level (L) is -1 ?
(a) Principal. (b) Subsidiary. (c) Magnetic. (d) Spin.
- 21 The number of orbitals in each principal energy level (n) equals
(a) n^2 (b) $2l + 1$ (c) $n + l$ (d) $2n^2$
- 22 The number of orbitals of the principal level N equals
(a) 1 (b) 9 (c) 14 (d) 16
- 23 The orbitals in the same sublevel are different in
(a) energy. (b) spatial orientation.
(c) shape. (d) size.

- 24 What is the maximum number of electrons required to saturate one orbital in $4f$ sublevel ?
 (a) $2e^-$ (b) $7e^-$ (c) $10e^-$ (d) $14e^-$
- 25 What are the similar quantum numbers between the 2 electrons of the two orbitals $2p_x^1, 2p_y^1$?
 (a) n, m_s, ℓ (b) n, ℓ, m_ℓ, m_s (c) n, m_s only. (d) n, m_ℓ, ℓ
- 26 Which of the following quantum numbers its (their) values are never negative ?
 (a) n only. (b) ℓ only. (c) m_ℓ, m_s (d) n, ℓ
- 27 The least possible value for the subsidiary quantum number of the electron whose magnetic quantum number ($m_\ell = -1$) is
 (a) 0 (b) 1 (c) 2 (d) 3
- 28 The maximum value for the quantum number m_ℓ of an electron found in the third principal energy level is
 (a) 0 (b) +1 (c) +2 (d) +3
- 29 What are the three quantum numbers which are included in the solution of the wave equation to explain the behavior of the electron in hydrogen atom ?
 (a) n, ℓ, m_s (b) m_ℓ, m_s, m_p (c) n, ℓ, m_ℓ (d) ℓ, m_ℓ, m_s
- 30 When the electron in hydrogen atom transfers from $4d$ to $2s$, the emitted photon is in the form of
 (a) infrared ray. (b) ultraviolet ray. (c) visible light. (d) X ray.
- 31 All the following describe the sublevel s , except that
 (a) it is found in all principal energy levels of the atom.
 (b) its energy increases by increasing the value of n
 (c) its electron capacity increases by increasing the value of n
 (d) its shape does not change by changing the value of n
- 32 What is the sublevel in which the last electron has the two quantum numbers ($n = 2, \ell = 0$) ?
 (a) $2s$ (b) $2p$ (c) $1s$ (d) $3p$

- 33** Which of the following can be concluded from the relation : $2\ell + 1 = 5$?
- (a) This sublevel is saturated with $10e^-$
 - (b) This sublevel is found in the second principal energy level.
 - (c) The maximum value of the magnetic quantum number of the electrons of this sublevel is -3
 - (d) The maximum number of electrons which saturate this sublevel is $5e^-$
- 34** The electron which has the two quantum numbers ($n = 3$, $m_\ell = +2$) must have the value
- (a) $m_s = +\frac{1}{2}$
 - (b) $\ell = 1$
 - (c) $\ell = 0$
 - (d) $\ell = 2$
- 35** Which of the following represents an electron in an atom ?
It is found in
- (a) the principal energy level L , and its subsidiary quantum number is 2
 - (b) the principal energy level K , and its magnetic quantum number is $+1$
 - (c) the principal energy level M , and its subsidiary quantum number is 2
 - (d) the principal energy level N, and its principal quantum number is 2
- 36** Which of the following quantum numbers represent an electron in the orbital $3p_x$?
- (a) $n = 3$, $\ell = 2$, $m_\ell = -1$
 - (b) $n = 3$, $\ell = 0$, $m_\ell = 0$
 - (c) $n = 3$, $\ell = 0$, $m_\ell = +1$
 - (d) $n = 3$, $\ell = 1$, $m_\ell = -1$
- 37** Which of the following combinations of quantum numbers represents an electron in one of the orbitals of $5f$ sublevel ?
- (a) $n = 5$, $\ell = 3$, $m_\ell = +4$, $m_s = +\frac{1}{2}$
 - (b) $n = 5$, $\ell = 2$, $m_\ell = -2$, $m_s = +\frac{1}{2}$
 - (c) $n = 5$, $\ell = 3$, $m_\ell = +1$, $m_s = +\frac{1}{2}$
 - (d) $n = 5$, $\ell = 4$, $m_\ell = -4$, $m_s = -\frac{1}{2}$
- 38** The five electrons present in the sublevel $3d^5$ are similar in all the following, except the
- (a) principal quantum number.
 - (b) subsidiary quantum number.
 - (c) magnetic quantum number.
 - (d) spin quantum number.
- 39** The energy of the orbital ($3p_z$) is similar to that of the orbital
- (a) $4p_y$
 - (b) $3p_y$
 - (c) $3s$
 - (d) $2p_z$
- 40** The two orbitals ($2s$, $2p_x$) can be similar in
- (a) the energy.
 - (b) the shape.
 - (c) the number of electrons in each of them.
 - (d) the spatial orientation.

- 41 The given diagram illustrates an orbital in a sublevel of an atom.



All the following can describe this orbital, except that

- (a) it becomes filled by 2 electrons.
 (b) it belongs to the sublevel p
 (c) it is one of the orbitals found in the first principal level.
 (d) it is one of the orbitals found in the second principal level.
- 42 The electrons of $5d$ sublevel in one of the atoms cannot have the magnetic quantum number

- (a) +1 (b) -1 (c) +2 (d) +3

- 43 The electron which has the magnetic quantum number (-3) may have the principal quantum number

- (a) 1 (b) 2 (c) 3 (d) 4

- 44 Number of orbitals of the sublevel whose electrons have the values ($n = 3$), ($l = 2$) is

- (a) 2 (b) 3 (c) 5 (d) 7

- 45 The electron which has the four quantum numbers :

($n = 4$, $l = 3$, $m_l = +2$, $m_s = +\frac{1}{2}$) is found in the sublevel

- (a) d (b) f (c) p (d) s

- 46 Which of the following quantum numbers do not include a mistake ?

- (a) $n = 5$, $l = 2$, $m_l = -1$ (b) $n = 3$, $l = 0$, $m_l = +\frac{1}{2}$
 (c) $n = 4$, $l = 1$, $m_l = -2$ (d) $n = 1$, $l = 1$, $m_l = 0$

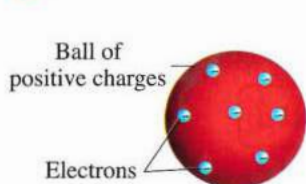
- 47 Which of the following quantum numbers include a mistake ?

- (a) $n = 4$, $l = 2$, $m_l = -1$ (b) $n = 4$, $l = 1$, $m_l = 0$
 (c) $n = 3$, $l = 0$, $m_l = 1$ (d) $n = 2$, $l = 0$, $m_l = 0$

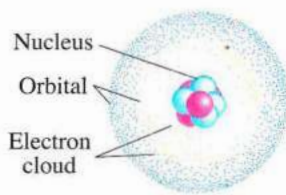
Essay questions

- 48 Give reason : The electron has dual nature.

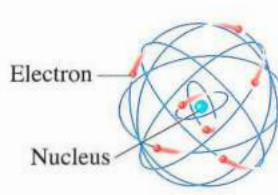
- 49 The figures below illustrate 3 different atomic models :



(X)



(Y)



(Z)

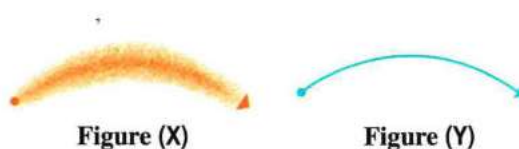
Arrange these figures from the oldest to the newest according to the development of the concept of the atomic structure.

50 The following statements represent the attempts to develop the atomic model in no particular order :

- (A) : The electron has wave properties in addition to its particle nature.
- (B) : The electrons revolve around the nucleus in definite orbits.
- (C) : In the center of the atom, a small nucleus is found which is of high density.
- (D) : The atom is solid and electrically neutral.

What is the correct sequence of these attempts ?

51 The two opposite figures represent two different perceptions for the movement of the electrons around the nucleus, predict :



- (1) The name of the scientist who suggested the perception which is illustrated in the figure (Y).
- (2) The scientific term that represents the region in which the electron can be found in the figure (X).

52 State each of the following :

- (1) The possible (ℓ) values of the electrons in the principal energy level ($n = 4$).
- (2) The possible (m_ℓ) values of the electrons in the sublevel ($\ell = 3$).

53 Show which is higher, with elucidating the reason, the maximum number of electrons in the principal level ($n = 2$) or the maximum number of electrons in the sublevel ($4d$).

54 Estimate the number of the orbitals which can be occupied by electrons in the principal level ($n = 2$).

55 Estimate the number of the orbitals which are present in the sublevel $4d$

56 What is the value of the subsidiary quantum number of the orbital of $4s$ sublevel ?

57 The opposite diagram represents the energy sublevels of the principal energy level ($n = 4$).

Complete the blank cells with the suitable magnetic quantum numbers (m_ℓ).

Sublevel f	
Sublevel d	
Sublevel p	
Sublevel s	

58 Suggest the reason of invalidity of each of the following sets of quantum numbers :

- (1) $n = 3$, $\ell = 3$, $m_\ell = +2$
 (2) $n = 2$, $\ell = 1$, $m_\ell = -2$
 (3) $n = 1$, $\ell = 0$, $m_\ell = +\frac{1}{2}$, $m_s = +\frac{1}{2}$

59 Complete the following table :

(n)	(ℓ)	(m_ℓ)	The orbital
2	1	-1	$2p_x$
1	0	0	.....
4	.....	+3	.....
.....	.....	.....	$4p_y$
3	2	-2	.....

60 The opposite figures represent 3 different orbitals in an atom, complete below figures (Y) and (Z) with what is suitable, taking into consideration the sizes of the orbitals.



Figure (X)
 $3s$



Figure (Y)
.....



Figure (Z)
.....

Higher – order questions

Answered in detail

Choose the correct answer :

- 61 What is the maximum number of electrons which can be found in the same atom and have the two quantum numbers ($n = 4$, $\ell = 2$) ?
 (a) $2e^-$ (b) $6e^-$ (c) $8e^-$ (d) $10e^-$
- 62 What is the maximum number of electrons which have the spin quantum number ($m_s = +\frac{1}{2}$) in the sublevel ($\ell = 3$) ?
 (a) $3e^-$ (b) $5e^-$ (c) $7e^-$ (d) $14e^-$
- 63 Number of the electrons which saturate each sublevel is estimated from the relation
 (a) $2(2\ell + 1)$ (b) $(2\ell + 1)$ (c) $2n^2$ (d) n^2

64 If the number of the orbitals in a certain sublevel is Z , then its subsidiary quantum number equals

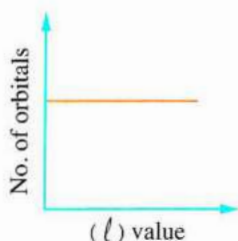
(a) $\frac{Z}{2}$

(b) $2Z - 1$

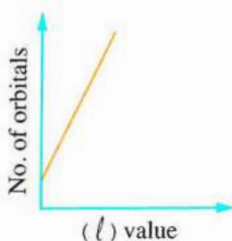
(c) $\frac{Z-1}{2}$

(d) $\frac{2Z-1}{2}$

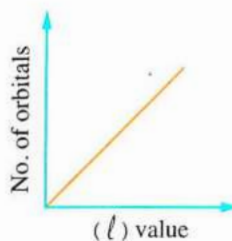
65 Which of the following charts represents the relation between (ℓ) value and the number of the orbitals in the sublevel ?



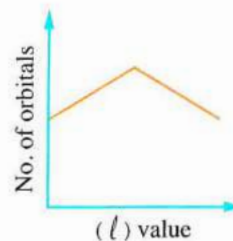
(a)



(b)

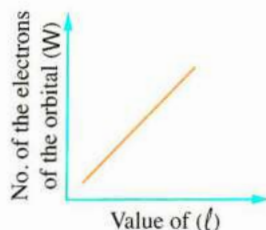


(c)

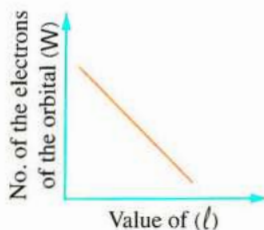


(d)

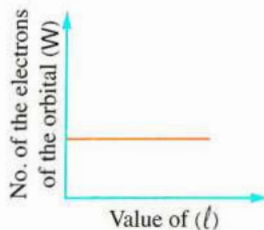
66 Which of the following graphical figures represents the relation between the number of the electrons which fill the orbital (W) in a certain sublevel and the value of (ℓ) of this sublevel ?



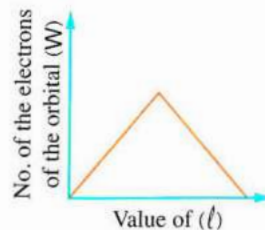
(a)



(b)



(c)

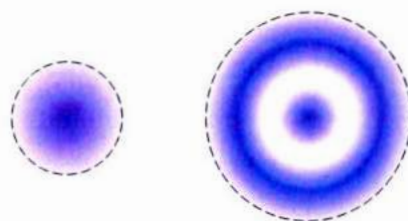


(d)

67 The two opposite figures represent two different sublevels.

What is the difference between them ?

- (a) Subsidiary quantum number.
- (b) Electron capacity.
- (c) Principal quantum number.
- (d) Number of orbitals.



68 Which of the following becomes saturated with the highest number of electrons ?

- (a) One of $4f$ orbitals.
- (b) $3d$ sublevel.
- (c) Principal level ($n = 2$).
- (d) One of $3d$ orbitals.

- 69 Electron (X) has the following quantum numbers : ($n = 3$, $\ell = 2$, $m_\ell = -1$, $m_s = -\frac{1}{2}$).

What are the quantum numbers of the electron (Y) which have the same energy of the electron (X), but it differs from the electron (X) in the direction of the spin motion ?

- (a) $n = 3$, $\ell = 2$, $m_\ell = -1$, $m_s = +\frac{1}{2}$ (b) $n = 3$, $\ell = 1$, $m_\ell = -1$, $m_s = -\frac{1}{2}$
(c) $n = 3$, $\ell = 2$, $m_\ell = 0$, $m_s = -\frac{1}{2}$ (d) $n = 2$, $\ell = 1$, $m_\ell = 0$, $m_s = +\frac{1}{2}$

Essay question :

- 70 Calculate the maximum number of electrons that can be found in an atom and have the following quantum numbers :

(1) $n = 3$

(2) $n = 2$, $\ell = 0$

Questions

Chapter

2

Lesson Three

Answered

Questions for the general stream and Al-Azhar students ?

Multiple choice questions (MCQ)



Pauli's exclusion principle

- 1 The two electrons of $3s$ sublevel differ in the
- (a) principal quantum number.
 - (b) subsidiary quantum number.
 - (c) magnetic quantum number.
 - (d) spin quantum number.

- 2 Which of the following statements is correct ?

- (a) It is possible sometimes to determine the position and the speed of the electron together precisely at the same time.
- (b) The sizes of the orbitals of the same atom are similar.
- (c) The probability of the presence of the electron in the spaces between the energy levels increases.
- (d) The two electrons of helium atom do not have the same four quantum numbers.

- 3 If two electrons have the same four quantum numbers, it means that these two electrons are found in

- (a) the same principal level.
- (b) two different atoms.
- (c) the same orbital.
- (d) the same sublevel.

- 4 The two electrons in the same atom which have the same energy and the same m_s value are located in the same

- (a) sublevel but in two different orbitals.
- (b) principal level but in two different sublevels.
- (c) orbital.
- (d) principal level but in two different orbitals.

- 5 The values of the spin quantum number of the electrons of the orbitals of the same sublevel differ when the number of its electrons

- (a) equals half the number of the orbitals.
- (b) is higher than the number of the orbitals.
- (c) is lower than the number of the orbitals.
- (d) equals the number of the orbitals.

Aufbau (Building up) principle

- 6 $(n + l)$ represents the energy of the

- (a) sublevel.
- (b) atom.
- (c) principal level.
- (d) electron cloud.

- 7 When the $3d$ sublevel is completely filled with electrons, the new electron occupies the
- (a) $4s$ sublevel. (b) $4p$ sublevel. (c) $4d$ sublevel. (d) $4f$ sublevel.
- 8 If the energy sublevel d in an atom contains $8e^-$, so the number of its half filled orbitals is
- (a) 1 (b) 2 (c) 4 (d) 5
- 9 What is the number of the completely filled orbitals in a carbon atom ${}_6\text{C}$ in its ground state ?
- (a) 1 (b) 2 (c) 3 (d) 5
- 10 The total number of the half filled orbitals in ${}_9\text{F}$ atom in its ground state is
- (a) 1 (b) 2 (c) 3 (d) 5
- 11 Which of the following sublevels has the least energy ?
- (a) ns (b) $(n-1)p$ (c) $(n-2)d$ (d) $(n-3)p$
- 12 According to the building-up principle,
- (a) it is impossible to determine both the position and the speed of the nuclear particles together precisely.
- (b) the electron occupies the orbital with the lower energy first.
- (c) the orbital contains mostly 2 electrons.
- (d) the electrons occupy the equal energy orbitals singly first before being paired.
- 13 Which is easier, losing an electron from $3d$ or from $4s$?
- (a) From $4s$, as it is closer to the nucleus than $3d$
- (b) From $3d$, as it is closer to the nucleus than $4s$
- (c) From $4s$, as it is farther from the nucleus than $3d$
- (d) From $3d$, as it is farther from the nucleus than $4s$
- 14 What is the number of the electrons which have magnetic quantum number ($m_l = 0$) in cobalt (II) ion ${}_{27}\text{Co}^{2+}$?
- (a) $7e^-$ (b) $8e^-$ (c) $10e^-$ (d) $11e^-$
- 15 The total number of the orbitals which are filled with electrons in the two energy levels ($M + L$) of the atom of argon ${}_{18}\text{Ar}$ is
- (a) 4 (b) 8 (c) 9 (d) 13
- 16 Which of the following represents the possible quantum numbers of the last electron in oxygen atom ?
- (a) $n = 2$, $l = 1$, $m_l = +1$, $m_s = +\frac{1}{2}$
- (b) $n = 2$, $l = 1$, $m_l = +1$, $m_s = -\frac{1}{2}$
- (c) $n = 2$, $l = 1$, $m_l = -1$, $m_s = +\frac{1}{2}$
- (d) $n = 2$, $l = 1$, $m_l = -1$, $m_s = -\frac{1}{2}$

17 Which of the following are the possible quantum numbers of the last electron which has the highest energy in vanadium $_{23}\text{V}$ atom ?

- (a) $n = 3$, $l = 2$, $m_l = 0$, $m_s = +\frac{1}{2}$
 (b) $n = 3$, $l = 2$, $m_l = 0$, $m_s = -\frac{1}{2}$
 (c) $n = 4$, $l = 0$, $m_l = 0$, $m_s = +\frac{1}{2}$
 (d) $n = 4$, $l = 0$, $m_l = +1$, $m_s = -\frac{1}{2}$

18 Which of the following are the quantum numbers of the 19th electron in the atom of chromium $_{24}\text{Cr}$?

- (a) $n = 3$, $l = 0$, $m_l = 0$, $m_s = +\frac{1}{2}$
 (b) $n = 3$, $l = 2$, $m_l = -2$, $m_s = +\frac{1}{2}$
 (c) $n = 4$, $l = 0$, $m_l = 0$, $m_s = +\frac{1}{2}$
 (d) $n = 4$, $l = 1$, $m_l = -1$, $m_s = +\frac{1}{2}$

19 Which of the following combinations of quantum numbers represents the single electron in the atom of gallium element $_{31}\text{Ga}$?

Choices	n	l	(m_l)	(m_s)
(a)	3	1	+1	$+\frac{1}{2}$
(b)	4	0	0	$-\frac{1}{2}$
(c)	4	1	-1	$+\frac{1}{2}$
(d)	4	2	+1	$+\frac{1}{2}$

20 Which of the electrons that have the following quantum numbers has the highest energy ?

- (a) $n = 3$, $l = 2$, $m_l = +1$, $m_s = +\frac{1}{2}$
 (b) $n = 4$, $l = 2$, $m_l = -1$, $m_s = +\frac{1}{2}$
 (c) $n = 4$, $l = 1$, $m_l = 0$, $m_s = -\frac{1}{2}$
 (d) $n = 5$, $l = 0$, $m_l = 0$, $m_s = +\frac{1}{2}$

21 What is the number of the electrons which have the principal quantum number ($n = 4$) in the atom of potassium element $_{19}\text{K}$?

- (a) $1e^-$ (b) $2e^-$ (c) $3e^-$ (d) $4e^-$

22 What is the number of the electrons which have the same l and m_l values in the atom of the element $_{15}\text{X}$?

- (a) $3e^-$ (b) $5e^-$ (c) $9e^-$ (d) $15e^-$

- 23 The opposite table represents the number of electrons which are present in the principal energy levels of an atom of an element in its ground state.

Energy level	K	L	M	N
Number of electrons	2	8	8	2

What is the number of the electrons which have a subsidiary quantum number ($\ell = 1$) ?

- (a) $8e^-$ (b) $10e^-$ (c) $12e^-$ (d) $20e^-$

- 24 What is the atomic number of the element whose electrons occupy 8 orbitals ?

- (a) 8 (b) 14 (c) 15 (d) 26

- 25 Which of the following is the number of the completely filled orbitals in an element ?

What is the atomic number of this element ?

Choices	Number of the completely filled orbitals	Atomic number
(a)	9	25
(b)	10	20
(c)	12	22
(d)	13	24

- 26 The number of the orbitals which are half filled with electrons equals the numerical value of the principal quantum number of the electrons of the last energy sublevel in the atom of the element

- (a) ${}_7\text{N}$ (b) ${}_8\text{O}$ (c) ${}_9\text{F}$ (d) ${}_{10}\text{Ne}$

- 27 What is the number of the electrons which can have the magnetic quantum number -3 in the sublevel $4f^9$?

- (a) $1e^-$ (b) $2e^-$ (c) $3e^-$ (d) $4e^-$

- 28 An element its valence shell contains a number of electrons equals each of :

- Number of the principal levels.
- Number of the sublevels.
- Number of its orbitals.

What is the symbol of this element ?

- (a) ${}_3\text{Li}$ (b) ${}_2\text{He}$ (c) ${}_4\text{Be}$ (d) ${}_7\text{N}$

29 In iron element $_{26}\text{Fe}$, the number of the half filled orbitals is equal to the value of one of the quantum numbers of the farthest electron from the nucleus.

Which of the following is this quantum number ?

- (a) Principal quantum number. (b) Subsidiary quantum number.
(c) Magnetic quantum number. (d) Spin quantum number.

30 What is the number of electrons of the penultimate principal energy level of the element whose atomic number is 28 ?

- (a) $2e^-$ (b) $8e^-$ (c) $14e^-$ (d) $16e^-$

31 What is the electron configuration of the outermost (third) energy level of a stable atom that has 7 valence electrons ?

- (a) $3s^1, 3p^6$ (b) $3s^1, 3p^4, 3d^2$ (c) $3s^2, 3p^5$ (d) $3s^2, 2p^4, 3d^1$

32 What is the electron configuration which represents an excited atom ?

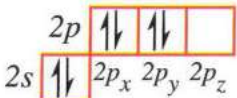
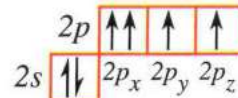
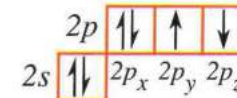
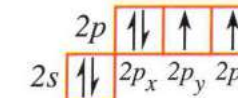
- (a) $1s^2, 2s^1$ (b) $1s^2, 2s^2, 2p^6, 3s^2$
(c) $1s^2, 2s^2, 2p^2, 3s^1$ (d) $1s^2, 2s^2, 2p^3$

Hund's rule

33 According to Hund's rule, the electron configuration of nitrogen element ($_7\text{N}$) is

- (a) $1s^2, 2s^2, 2p^3$ (b) 2, 5
(c) $1s^2, 2s^2, 2p_x^1, 2p_y^1, 2p_z^1$ (d) $1s^2, 2s^1, 2p^4$

34 According to Hund's rule the electron configuration of the last energy level of $_8\text{O}$ is

- (a)  (b)  (c)  (d) 

35 The presence of 3 unpaired electrons in phosphorus atom $_{15}\text{P}$ in its ground state can be explained by

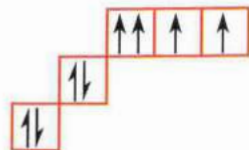
- (a) Pauli's exclusion principle. (b) Hund's rule.
(c) the uncertainty principle. (d) Aufbau principle.

36 Which of the following violates Pauli's principle ?

- (a)  (b) 
(c)  (d) 

37 This configuration of fluorine atom ${}_9\text{F}$ in its stable state does not obey

- (a) Aufbau principle only.
- (b) Hund's rule only.
- (c) exclusion principle only.
- (d) both Hund's rule and exclusion principle.



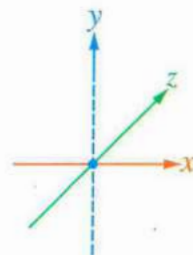
Essay questions



38 Arrange each of the following :

- (1) $(3d / 4d / 4p / 4s / 3p / 5s)$ according to the successive filling of the sublevels with electrons by following Aufbau principle.
- (2) $(5s / 5f / 4d)$ according to the energy of each sublevel.

39 Reuse the opposite figure of the three axes to draw the shapes of the orbitals of sublevels in the principal level ($n = 2$).



40 According to Pauli's exclusion principle, no two electrons in the same atom can have the same four quantum numbers.

What are the similarities between the probabilities of the quantum numbers of two electrons found in the same orbital in $2p$ sublevel ? In what may they differ ?

41 Write the electron configuration of each of the following :

(1) According to Aufbau principle :



(2) According to Hund's rule :



42 Write the probabilities of the four quantum numbers of the last electron in :

- (1) Sodium atom ${}_{11}\text{Na}$
- (2) Element (X) atom in which $3p$ sublevel contains 2 electrons.

43 Apply Pauli's principle to the two electrons of the last orbital of chloride ion ${}_{17}\text{Cl}^-$

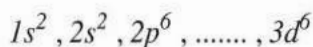
44 Illustrate with explanation whether each of Pauli's principle and Hund's rule is applied to each of the following cases :



45 Deduce the atomic number of the element whose last electron has the quantum numbers :
 $(n = 2, \ell = 1, m_\ell = +1, m_s = +\frac{1}{2})$

- 46 What is the maximum number of electrons in an atom in which the last electron with the highest energy has the two quantum numbers : $n = 3$, $m_s = +\frac{1}{2}$

- 47 Complete the electron configuration of the following element :



Then, conclude :

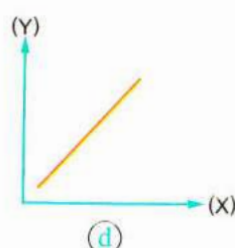
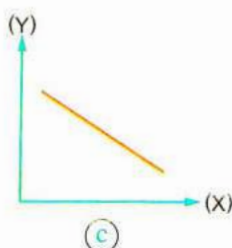
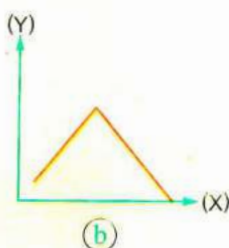
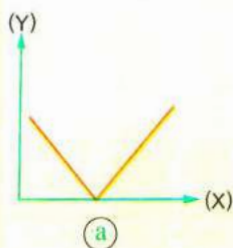
- (1) The atomic number of the element.
 - (2) Number of its principal levels which are occupied by electrons.
 - (3) Number of its sublevels which are occupied by electrons.
 - (4) Number of the unpaired electrons in $3d$ sublevel.
- 48 An element (X) its electrons are distributed in four principal energy levels, the last level contains a number of electrons equals double the number of electrons of the energy level K :
- (1) Write the electronic configuration of the element (X) according to Aufbau principle.
 - (2) What are the quantum numbers of the last electron in the atom of this element ?

Higher – order questions

Answered in detail

Choose the correct answer :

- 49 The two electrons, found in the same sublevel, which have the same m_s value must differ in the value(s) of
- (a) n only. (b) l only. (c) m_l only. (d) l and m_l
- 50 What is the number of electrons of the last principal energy level in the element which contains 15 completely filled and 2 half filled orbitals ?
- (a) $2e^-$ (b) $3e^-$ (c) $4e^-$ (d) $5e^-$
- 51 Which of the following charts represents the relation between (X) which represents the number of the electrons of the sublevel $3d$ and (Y) which represents the number of the single (unpaired) electrons in this sublevel ?



- 52 The last energy sublevel in an element consists of 3 orbitals X, Y and Z containing only one electron, and the value $(n + \ell)$ of this sublevel equals 5
What is the atomic number of this element ?

(a) 19 (b) 31 (c) 33 (d) 41

- 53 An element (X), the principal quantum number of its farthest electron from the nucleus is $(n = 4)$, if the number of electrons found in the energy level M is double their number in the level L
What is the atomic number of (X) ?

(a) 18 (b) 26 (c) 28 (d) 36

- 54 The atom of element (X) has 3 occupied principal levels, and the summation of the spin quantum numbers of its valence electrons is $1\frac{1}{2}$
(assuming the possibility of summation).
What is the atomic number of element (X) ?

(a) 14 (b) 15 (c) 18 (d) 23

- 55 The last sublevel in X^{3+} ion is $2p^6$
What is the number of the half filled orbitals in the atom of (X) ?

(a) Zero (b) 1 (c) 2 (d) 3

- 56 Which of the following represents the electronic configuration of the atom of gallium $_{31}\text{Ga}$ in its excited state ?

(a) 2, 8, 17, 3 (b) 2, 8, 17, 4 (c) 2, 8, 18, 3 (d) 2, 8, 18, 4

- 57 Which of the following represents the spin motion of the electrons of the last energy sublevel in $_{18}\text{Ar}$ atom ?

(a) 

(b) 

(c) 

(d) 

- 58 According to Hund's rule and Pauli's exclusion principle, the last two electrons in 3d sublevel in the atom of the element $_{26}\text{X}$ are different in the two quantum numbers

(a) ℓ and m_ℓ (b) n and m_ℓ (c) ℓ and m_s (d) m_ℓ and m_s



Choose the correct answer for the questions 1 : 20

20 marks

1 A student has presumed wrongly that the two electrons (X) and (Y) which are in the same atom have the following quantum numbers :

- Electron (X) : $n = 4$, $\ell = 0$, $m_\ell = 0$, $m_s = +\frac{1}{2}$
- Electron (Y) : $n = 4$, $\ell = 0$, $m_\ell = 0$, $m_s = +\frac{1}{2}$

What is the rule or the principle which explains this mistake ?

- (a) Pauli's exclusion principle. (b) Aufbau principle.
(c) Hund's rule. (d) Uncertainty principle.

2 The number of the orbitals of the sublevel which has the two values ($n = 4$, $\ell = 3$) is

- (a) 2
(b) 3
(c) 5
(d) 7

3 What does the opposite figure represent ?

- (a) The structure of helium atom ${}_2\text{He}$
(b) The two electrons of p_x are in a spin-paired state.
(c) The two electrons of the same orbital carry the same charge.
(d) Hund's rule.

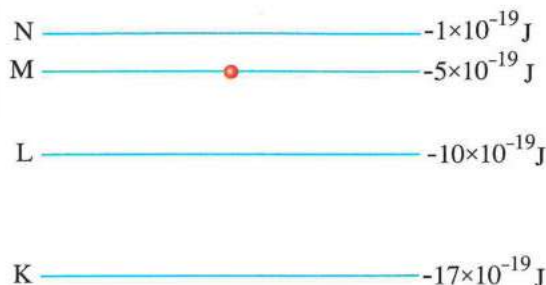


4 What is the atomic number of the element whose level which has the principal quantum number ($n = 3$) contains 13 electrons ?

- (a) 17
(b) 23
(c) 25
(d) 43

- 5 The opposite figure demonstrates the energy levels of a hypothetical atom, if an electron transfers from the energy level M to K, then it

- (a) acquires an amount of energy equals $5 \times 10^{-19} \text{ J}$
 (b) acquires an amount of energy equals $12 \times 10^{-19} \text{ J}$
 (c) loses an amount of energy equals $5 \times 10^{-19} \text{ J}$
 (d) loses an amount of energy equals $12 \times 10^{-19} \text{ J}$



- 6 An electron with the quantum numbers :

$$(n = 4, \ell = 1, m_\ell = -1, m_s = +\frac{1}{2}).$$

What is the sublevel of this electron ?

- (a) 4s (b) 4p (c) 4d (d) 4f

- 7 What is the maximum number of electrons that can have the quantum numbers $(n = 3, \ell = 1, m_\ell = -1)$ in the same atom ?

- (a) $10e^-$
 (b) $6e^-$
 (c) $4e^-$
 (d) $2e^-$

- 8 The electrons of the last energy level in neon $_{10}\text{Ne}$ atom occupy several orbitals which have two different shapes.

Which of the following represents correctly one of these orbitals ?

Choices	Shape of the orbital	Energy of this orbital compared to the other orbitals
(a)		Higher than or equal to them
(b)		Higher than or equal to them
(c)		Lower than or equal to them
(d)		Lower than or equal to them

- 9 The number of the electrons found in the orbitals of s sublevel equals that found in the orbitals of p sublevel in the atom of
- (a) $_{14}\text{Si}$ (b) $_{12}\text{Mg}$ (c) $_{11}\text{Na}$ (d) $_{7}\text{N}$
- 10 On comparing the energy and the charge of the electrons in the energy level L in beryllium Be atom to those of the electrons of the energy level K they are found to have
- (a) lower energy but the same charge. (b) higher energy but the same charge.
(c) lower energy but the same (n) value. (d) higher energy but the same (n) value.
- 11 Which of the following electronic configurations violates Aufbau principle ?
- (a)  (b) 
- (c)  (d) 
- 12 Which of the following sets of quantum numbers expresses the electron of an excited hydrogen atom ?
- (a) $n = 4$, $l = 3$, $m_l = -3$ (b) $n = 4$, $l = 4$, $m_l = -2$
(c) $n = 5$, $l = -1$, $m_l = +2$ (d) $n = 3$, $l = 1$, $m_l = -2$
- 13 What is the maximum number of electrons in an atom which has the two quantum numbers ($n = 4$, $l = 1$) ?
- (a) 2 (b) 6 (c) 8 (d) 10
- 14 What is the correct order of the orbitals in titanium $_{22}\text{Ti}$ atom according to the increase of energy ?
- (a) $3s < 3p < 3d < 4s$ (b) $3s < 3p < 4s < 3d$
(c) $3s < 4s < 3p < 3d$ (d) $4s < 3s < 3p < 3d$
- 15 Which of the following electronic configurations represents the ground state of an atom that contains 8 electrons ?
- (a)  (b) 
- (c)  (d) 

16 What is the atomic number of the atom of the element whose orbitals contain 3 unpaired electrons ?

- (a) 5 (b) 13
(c) 15 (d) 21

17 Which of the following transfers in hydrogen atom produces the largest quantum of energy ?

- (a) $(n = 7) \longrightarrow (n = 6)$ (b) $(n = 6) \longrightarrow (n = 5)$
(c) $(n = 4) \longrightarrow (n = 3)$ (d) $(n = 2) \longrightarrow (n = 1)$

18 Which of the following represents the electronic configuration of an excited phosphorus atom ?

- (a) $1s^2, 2s^2, 2p^6, 3s^2, 3p^3$ (b) $1s^2, 2s^2, 2p^6, 3s^2, 3p_x^1, 3p_y^1, 3p_z^1$
(c) $1s^2, 2s^2, 2p^6, 3s^2, 3p^2, 4s^1$ (d) $1s^2, 2s^2, 2p^6, 3s^2, 3p$ 

19 Among the modifications introduced by the modern atomic theory to the older theories is

- (a) it is impossible to determine both the position and speed of the 11^{th} electron in ${}_{11}\text{Na}$ atom precisely at the same time.
(b) the electron is negatively charged.
(c) most of the atomic volume is an empty space.
(d) the spaces between energy levels are forbidden for the electrons.

20 The opposite electronic configuration violates

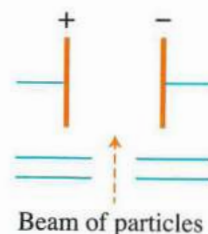


- (a) Aufbau principle only.
(b) Pauli's exclusion principle only.
(c) Hund's rule only.
(d) Pauli's principle and Hund's rule.

Answer the essay questions 21 : 23

4 marks

- 21 The scientists discovered the presence of the electrons, protons and neutrons in the atom during the centuries 19 and 20, if a beam of each of them is passed through an electric field (as in the opposite figure).



In which direction will the deflection be ? Explain.

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2 marks

- 22 Compare between Thomson's atomic model and Rutherford's atomic model in 2 points only.

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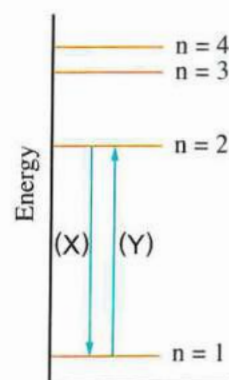
2 marks

- 23 In the opposite figure :

Which of the two processes

(X) and (Y) requires losing energy ?

What is the scientific term of this amount of energy in the light of Bohr's theory ?



1 mark

Questions

Chapter

3

Lesson One

Answered

Questions for the general stream and Al-Azhar students ?

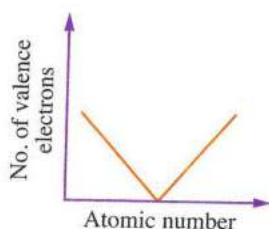
Multiple choice questions (MCQ)



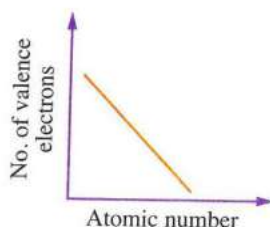
Modern periodic table

- 1 The elements of the same period are similar in the number of
- (a) valence electrons. (b) protons.
(c) energy levels. (d) neutrons.

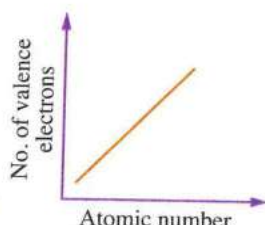
- 2 Which of the following charts represents the relation between the number of valence electrons and the atomic number in the elements of the same group ?



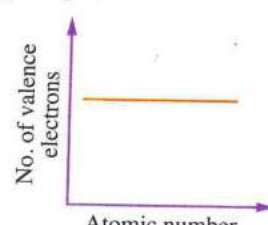
(a)



(b)



(c)



(d)

- 3 Which of the following elements is located in the same period of silicon $_{14}\text{Si}$ in the modern periodic table ?

(a) $_{32}\text{Ge}$

(b) $_{21}\text{Sc}$

(c) $_{11}\text{Na}$

(d) $_{38}\text{Sr}$

- 4 The properties of the two elements are similar.

(a) $_{19}\text{K}$, $_{29}\text{Cu}$

(b) $_{31}\text{Ga}$, $_{32}\text{Ge}$

(c) $_{17}\text{Cl}$, $_{35}\text{Br}$

(d) $_{55}\text{Cs}$, $_{56}\text{Ba}$

- 5 The element whose atomic number is 7 has similar properties to those of the element with the atomic number

(a) 8

(b) 15

(c) 19

(d) 21

- 6 The chemical properties of both cesium $_{55}\text{Cs}$ and element X are similar. What is the electron configuration of element X ?

(a) $1s^1$

(b) $[\text{Xe}]$, $6s^2$

(c) $[\text{Ar}]$, $3d^5$, $4s^1$

(d) $[\text{Ar}]$, $3d^{10}$, $4s^2$, $4p^6$, $5s^1$

- 7 What is the total number of the periods in the periodic table which lie between the periods of hydrogen element ($_{1}\text{H}$) and argon element ($_{18}\text{Ar}$) ?

(a) zero.

(b) 1 period.

(c) 2 periods.

(d) 3 periods.

The elements blocks and types of the modern periodic table

- 8 The molecule of the element whose electron configuration ends with np^6 consists of
- (a) one atom. (b) two atoms. (c) three atoms. (d) four atoms.
- 9 The element which is located at the top right of the modern periodic table is a
- (a) representative element. (b) noble element.
(c) main transition element. (d) metallic element.
- 10 What is the type of the elements whose last electron configuration is : $ns^2, np^{1:5}$?
- (a) Representative. (b) Main transition.
(c) Inner transition. (d) Noble.
- 11 What is the atomic number of the last element in d-block elements which is located in the fourth period ?
- (a) 21 (b) 29 (c) 30 (d) 36
- 12 What is the electron configuration of the elements of the penultimate column of d-block ?
- (a) $(n-1)d^1, ns^1$ (b) $(n-2)d^1, ns^1$ (c) $(n-1)d^2, ns^2$ (d) $(n-1)d^{10}, ns^1$
- 13 The elements which follow neon gas $_{10}\text{Ne}$ and precede rubidium element $_{37}\text{Rb}$ are located in
- (a) the third period only. (b) the fourth period only.
(c) the third and the fourth periods. (d) the fourth and the fifth periods.
- 14 What is the number of the elements in which f sublevel is successively filled ?
- (a) 32 (b) 46 (c) 28 (d) 14
- 15 What is the sublevel which is successively filled with electrons in the series of actinides ?
- (a) $3d$ (b) $4d$ (c) $4f$ (d) $5f$
- 16 Which of the following elements the electron configuration of its valence shell differs from those of the other elements that are located in the same group ?
- (a) $_{36}\text{Kr}$ (b) $_{19}\text{K}$ (c) $_4\text{Be}$ (d) $_2\text{He}$

- 17** What is the type of the element which the last electron in its atom has the two quantum numbers ($\ell = 1, m_s = +\frac{1}{2}$) ?
- (a) Representative only. (b) Noble only.
(c) Representative or noble. (d) Representative or main transition.
- 18** Which of the following choices represents the electron configuration of a representative element ?
- (a) $[\text{Ar}], 4s^1, 3d^5$ (b) $[\text{Ar}], 4s^2, 3d^6$
(c) $[\text{Rn}], 7s^1$ (d) $[\text{Xe}], 6s^2, 5d^1, 4f^7$
- 19** Which of the following choices represents the electron configuration of a transition element ?
- (a) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^2, 4p^6$
(b) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^2, 4p^1$
(c) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^2$
(d) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2$
- 20** Actinides are similar to lanthanides in
- (a) the successive filling of $4f$ sublevel.
(b) the instability of their nuclei.
(c) that it is impossible to determine the numbers of their groups.
(d) their location in the sixth period.
- 21** What is the difference in number between the representative elements found in the second period and those found in the third period ?
- (a) 0 (b) 2
(c) 8 (d) 10
- 22** Which of the following types of elements constitutes the largest number of elements in the fourth period ?
- (a) p-block elements. (b) Representative elements.
(c) Main transition elements. (d) Metals.

The electron configurations of elements in light of the modern periodic table

- 23 Each of the electron configurations in the table represents the mentioned type of elements, except

Choices	Electron configuration	Type of elements
(a)	$ns^{1:2}$ or ns^2, np^6	Representative
(b)	$1s^2$ or ns^2, np^6	Noble gas
(c)	$(n-1)d^{1:10}, ns^1$ or 2	Main transition element
(d)	$(n-2)f^{1:14}, (n-1)d^1$ or $0, ns^2$	Inner transition element

- 24 All the following are among the properties of the elements ${}_4\text{Be}$, ${}_{12}\text{Mg}$ and ${}_{20}\text{Ca}$, except that

- (a) the last sublevel s contains 2 electrons.
 (b) the sublevel p in the valence shell contains a pair of electrons.
 (c) they are all representative elements.
 (d) they are all located in group (2A).

- 25 What is the type of the element which contains 2 electrons in the sublevel whose quantum number (l) is 2 ?

- (a) Main transition. (b) Inner transition.
 (c) Noble. (d) Representative.

- 26 What is the type of the element whose electron configuration is : $[\text{Ar}], 4s^2, 3d^{10}, 4p^1$?

- (a) Main transition element. (b) Inner transition element.
 (c) Representative element. (d) Noble element.

- 27 The following diagram shows a section in the modern periodic table:

Li	Be														O	F	Ne
Na	Mg														S	Cl	Ar
K	Ca			V	Cr	Mn	Fe	Co	Ni					As	Se	Br	Kr

What is the number of each of the representative and the transition elements which are mentioned in this section ?

- (a) 16 representative and 6 transition. (b) 13 representative and 6 transition.
 (c) 6 representative and 8 transition. (d) 10 representative and 12 transition.

28 The electronic configuration of silver $_{47}\text{Ag}$ is

- (a) $[\text{Ar}] , 4s^2 , 4d^9$ (b) $[\text{Kr}] , 5s^1 , 4d^{10}$
(c) $[\text{Kr}] , 5s^2 , 3d^9$ (d) $[\text{Ar}] , 4s^1 , 4d^{10}$

29 An element with atomic number 42, the number of its half filled orbitals is

- (a) 1 (b) 4 (c) 5 (d) 6

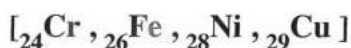
30 There is an anomaly in the electronic configuration of each of

- (a) $_{24}\text{Cr}^{3+} , _{26}\text{Fe}^{3+}$ (b) $_{48}\text{Cd} , _{30}\text{Zn}$ (c) $_{29}\text{Cu}^+ , _{27}\text{Co}$ (d) $_{24}\text{Cr} , _{29}\text{Cu}$

31 The two electron configurations are similar in

- (a) $_{11}\text{Na} , _{10}\text{Ne}$ (b) $_{11}\text{Na}^+ , _{12}\text{Mg}^{2+}$
(c) $_{12}\text{Mg}^+ , _{10}\text{Ne}$ (d) $_{11}\text{Na} , _{12}\text{Mg}^{2+}$

32 What is the correct order which represents the number of the unpaired electrons in the ions of these transition elements ?



- (a) $\text{Cu}^{2+} > \text{Ni}^{2+} > \text{Cr}^{3+} > \text{Fe}^{3+}$ (b) $\text{Cr}^{3+} > \text{Fe}^{2+} > \text{Ni}^{2+} > \text{Cu}^{2+}$
(c) $\text{Fe}^{3+} > \text{Cr}^{3+} > \text{Cu}^{2+} > \text{Ni}^{2+}$ (d) $\text{Fe}^{3+} > \text{Cr}^{3+} > \text{Ni}^{2+} > \text{Cu}^{2+}$

33 The electron configuration of ruthenium ion $_{44}\text{Ru}^{3+}$ is

- (a) $[\text{Kr}] , 4d^3 , 5s^2$ (b) $[\text{Kr}] , 4d^6 , 5s^2$
(c) $[\text{Kr}] , 4d^5$ (d) $[\text{Kr}] , 4d^6$

34 Which of the following statements represents properly the element which is located in period 3, group (VIIA) in the modern periodic table ?

- (a) It forms an ion whose charge is +1
(b) It is one of d-block elements.
(c) Its valence shell contains 5 electrons.
(d) It is a representative element which is located below fluorine $_{9}\text{F}$

35 What is the electron configuration of the ion of the element which lies in the 4th period, group 2A in the periodic table ?

- (a) $[\text{Ne}] , 3s^2 , 3p^6$ (b) $[\text{Ar}] , 4s^2$
(c) $[\text{Ne}] , 4s^2 , 4p^4$ (d) $[\text{Ar}] , 4s^2 , 4p^6$

36 The electron configuration of the ion X^{3+} ends with : $6s^0, 4f^{14}, 5d^8$

The element X lies in group

- (a) 8 (b) 10 (c) 11 (d) 9

37 The electron configuration of the outer energy levels in the element which lies in the period (n) and group (5B) is

- (a) $ns^2, (n-2)f^{14}, (n-1)d^5$ (b) $ns^2, (n-1)f^{14}, (n-1)d^3$
(c) $ns^2, (n-2)f^{14}, (n-1)d^3$ (d) $ns^2, (n-2)f^{14}, nd^3$

38 The element whose electron configuration ends with : $ns^1, (n-1)d^5$ and its electrons are distributed in 5 principal energy levels has the atomic number

- (a) 29 (b) 24 (c) 47 (d) 42

39 What is the maximum number of orbitals that can be occupied by electrons in each of the atoms of the elements of 6th period in which the electron has the quantum number ($m_l = +3$) ?

- (a) 1 (b) 3 (c) 5 (d) 7

40 What is the number of the half filled orbitals in the atom of the divalent representative element which is located in p-block in the periodic table ?

- (a) 1 (b) 2 (c) 4 (d) 5

41 What is the type of the divalent element whose ion has the electron configuration : [Ar] ?

- (a) Main transition. (b) Inner transition.
(c) Inert. (d) Representative.

42 An element is located in the third period, if its atom gains two electrons, then its last sublevel becomes completely filled with electrons.

What is the symbol of this element ?

- (a) ${}_{13}\text{Al}$ (b) ${}_{14}\text{Si}$ (c) ${}_{15}\text{P}$ (d) ${}_{16}\text{S}$

43 What are the possible quantum numbers of the last electron in the atom of an element which is located in the fourth period, group (7A) ?

- (a) $n = 4, l = 1, m_l = 0, m_s = -\frac{1}{2}$ (b) $n = 4, l = 1, m_l = -1, m_s = -\frac{1}{2}$
(c) $n = 4, l = 2, m_l = -1, m_s = +\frac{1}{2}$ (d) $n = 3, l = 0, m_l = 0, m_s = +\frac{1}{2}$

- 44 The shown diagram expresses a part in the modern periodic table :

	W	
X	Y	Z
	A	

If the electron configuration of the element W ends with $3p^2$
Which of the following describes one of the shown elements ?

- (a) Element W is representative and lies in group 3A
(b) Element Y lies in 3rd period, group 5A
(c) Element Z is a noble gas and lies in 3rd period.
(d) Element A lies in 4th period, group 3A
- 45 Three elements (A, B, C) are located in one period in 3 consecutive groups, the element (A) lies in the beginning of the third period, so the electron configuration of element (C) ends with

- (a) $4s^1$ (b) $3p^3$ (c) $3d^1$ (d) $3p^1$

- 46 The electrons of the atom of a representative element occupy 4 principal energy levels, and its last sublevel contains a number of electrons double their number in its first principal level.

What is the atomic number of this element ?

- (a) 34 (b) 33 (c) 32 (d) 31

- 47 If the electron configuration of an element atom is : $[\text{Xe}], 6s^2, 5d^1, 4f^7$

Which of the following choices represents the distribution of the electrons in the principal energy levels ?

- (a) 2 – 8 – 18 – 32 – 4 (b) 2 – 8 – 18 – 18 – 8 – 2
(c) 2 – 8 – 18 – 25 – 9 – 2 (d) 2 – 8 – 18 – 32 – 7

Essay questions



- 48 Give reason :

- (1) The elements of the same group are similar in the chemical properties.
(2) Molybdenum element $_{42}\text{Mo}$ has an anomalous electron configuration.

- 49 Demonstrate the similar electron configuration of the ions of zinc $_{30}\text{Zn}$ and copper $_{29}\text{Cu}$

- 50 The electron configuration of an element (X) ends with $5s^2, 4d^1$:

- (1) What is the type of this element ?
(2) Determine the location of this element in the periodic table.
(3) What is the number of the protons inside the nucleus of the atom of this element ?

58 Write the electron configuration of the element whose atomic number is 28, then identify :

- (1) Its block.
- (2) Its period in the periodic table.
- (3) Number of its partially filled orbitals.

59 An element its electron configuration ends with $4p^5$:

- (1) What is the atomic number of this element ?
- (2) State its location in the periodic table.
- (3) What are the predicted quantum numbers of the last electron in the sublevel of its atom ?

60 Write the electron configuration and the period of the element whose last electron has the following quantum numbers :

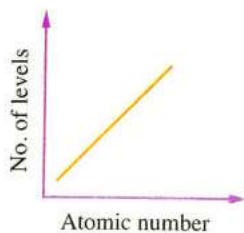
$$(n = 3, \ell = 1, m_\ell = -1, m_s = +\frac{1}{2})$$

Higher – order questions

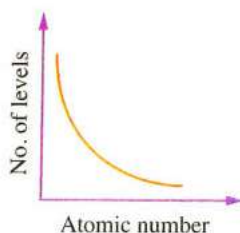
Answered in detail

Choose the correct answer :

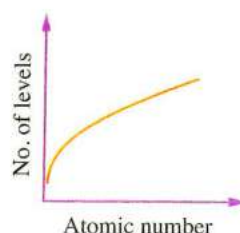
61 Which of the following charts represents the relation between the number of principal energy levels occupied by electrons and the atomic number of the elements in the same vertical group in the periodic table ?



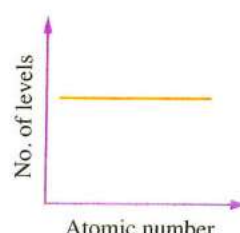
(a)



(b)



(c)



(d)

62 What is the compound in which the number of electrons of its positive ion equals the number of electrons of its negative ion ?



(a) MgCl_2

(b) NaCl

(c) MgO

(d) MgS

63 The element (X) which forms the compounds XCl_3 , X_2O_3 , is located in group

(a) IIIA

(b) IA

(c) IVA

(d) VIIA

64 The electron configuration of the positive ion of the compound MO ends with the sublevel $2p^6$

Which of the following determines the period and the group of element M in the modern periodic table ?

(a) 4th period, group 7

(b) 4th period, group 9

(c) 3rd period, group 16

(d) 3rd period, group 2

65 If the four quantum numbers of the electron with the highest energy in the atom of a main transition element located in the period (X) are $(3, 2, +2, +\frac{1}{2})$, then the probable four quantum numbers of the last electron in the representative element which is located at the end of the period (X) are

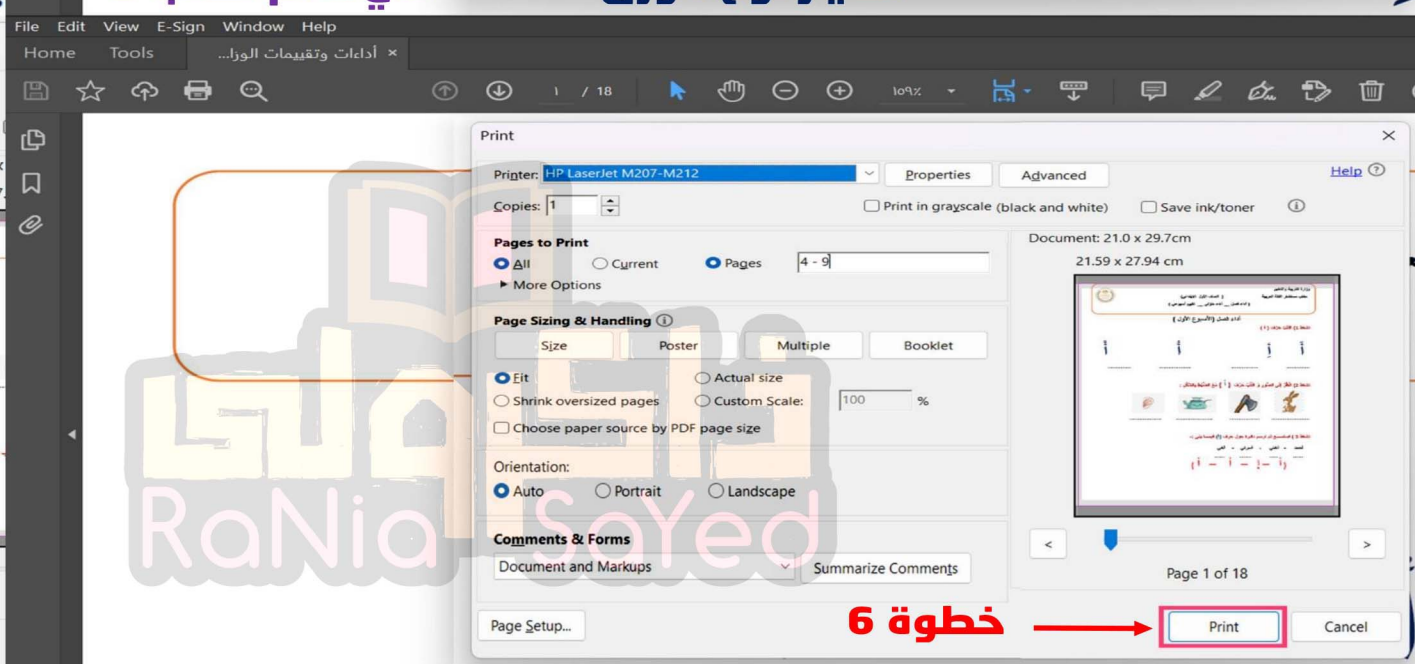
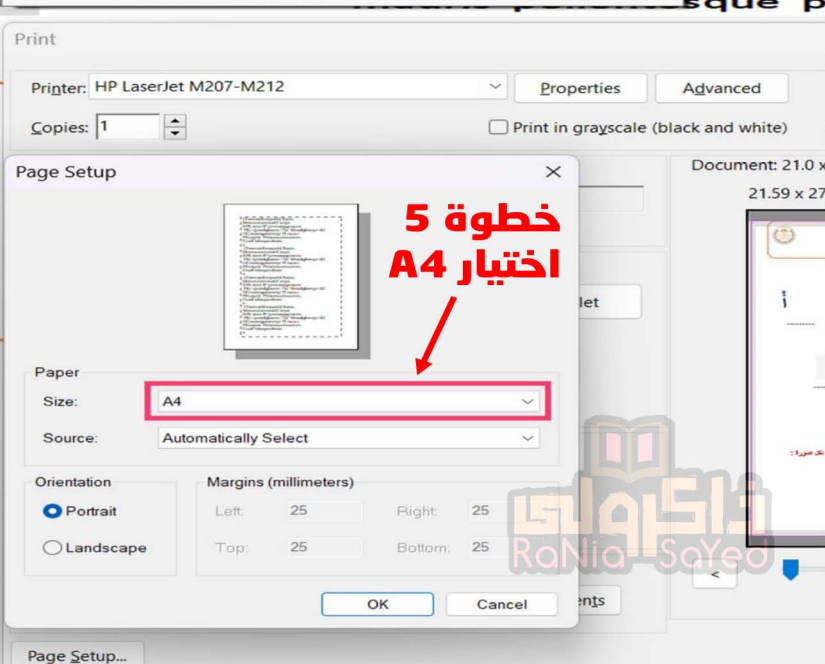
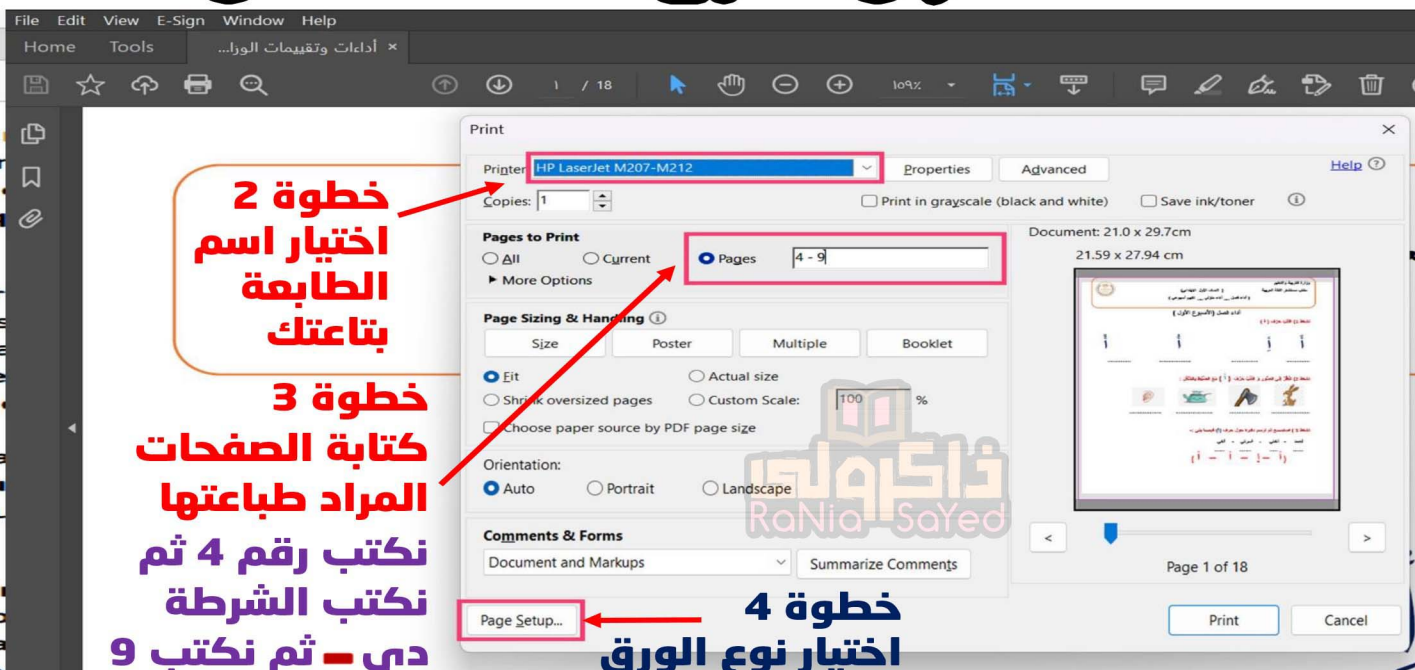
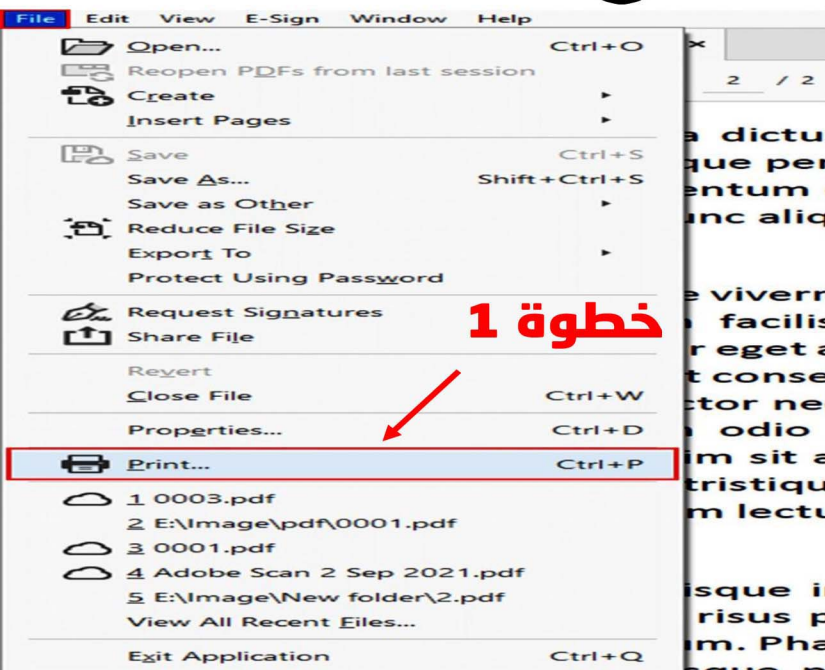
(a) 4, 1, 0, $-\frac{1}{2}$

(b) 3, 1, +1, $+\frac{1}{2}$

(c) 4, 0, 0, $+\frac{1}{2}$

(d) 3, 2, +2, $-\frac{1}{2}$

كيفية طباعة صفحات معينة من ملف معين مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9



حمل الآن

مجاناً وحصرياً

المراجعة رقم (2)

اختبار شهر نوفمبر



Home performance (Week 6)

Q1/ choose the correct answer:-

1- What happens to the energy required to excite an electron from level (n) To level (n+1) as the value of (n) increases?

- (a) The energy required for the transition decreases.
- (b) The energy required remains constant.
- (c) It is equal to the energy required for the transition from (n=1) to (n=2).
- (d) The energy required for the transition increases

2- If an electron moves from level (n=5) to level (n=1) and then returns to level (n=3), to which level must the electron return in order to emit a visible photon?

- (a) To level (n=4)
- (b) To level (n=1)
- (c) To level (n=3)
- (d) To level (n=2)

3- All of the following were later modified in the Bohr model due to the model's Inability to explain certain phenomena and concepts, except for?

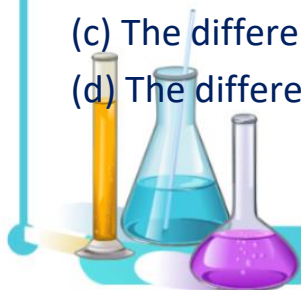
- (a) Electrons are only material particles
- (b) Electrons revolve in specific orbits
- (c) Atoms are flat and not three-dimensional
- (d) It is not possible to determine the speed and location of an electron at the Same time

4- The amount of energy required to transfer an electron from the first level (K) To the third level= (M)

- (a) Half a quantum
- (b) One quantum
- (c) 2 quanta
- (d) 3 quanta

5- The linear spectrum differs from one element to another due to.....

- (a) The difference in the number of neutrons in each.
- (b) The difference in the atomic number of each.
- (c) The difference in the mass number of each.
- (d) The difference in the number of valence electrons in each.



6- According to Bohr model, which of the following is necessary for an Electron transition from the second level ($n=2$) to the fourth level ($n=4$)?

- (a) It must lose an amount of energy equal to the difference between the Energies of the two levels.
- (b) It must gain an amount of energy equal to the difference between the Energies of the two levels.
- (c) It must lose an amount of thermal energy equal to the difference between The energies of the two levels.
- (d) It must gain an amount of energy greater than the difference between the Two levels.

7 - The spectral lines resulting from the return of electrons in hydrogen Atom to the first level is located in which region of the spectrum?

- (a) The infrared region.
- (b) The radio wave region.
- (c) The visible region.
- (d) Ultraviolet region.

8 - To obtain the visible spectrum of hydrogen atom for an electron excited To the second level (L), this electron must

- (a) Gain more energy and move to a higher level, then return to a stable state (Ground state).
- (b) Gain more energy and move to a higher level, then lose less energy than The total energy gained.
- (c) Gain more energy and move to a higher level, then lose energy equal to the Total energy gained.
- (d) Gain more energy and move to a higher level, then lose energy greater than The total energy gained.

9- All of the following cannot have a value of Zero except

- (a) Quantum
- (b) Principal quantum number (n)
- (c) Number of protons
- (d) Number of neutrons

10- The spectral lines resulting from the return of electrons in hydrogen Atom to the third level is located in which region of the spectrum?

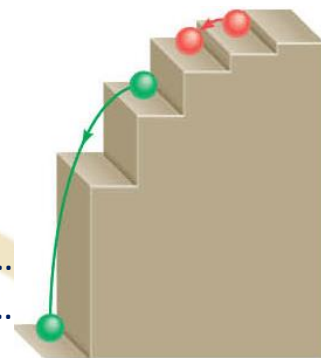
- (a) Infrared region.
- (b) Radio wave region.
- (c) Visible region.
- (d) Ultraviolet region.



Weekly assessment (Week-6)

Question (1):-

(1) The energy levels in Bohr's atomic model can be Expressed as steps on a stair, as shown in the figure, Where the ball does not settle between the steps of the Stair... Explain the previous statement.

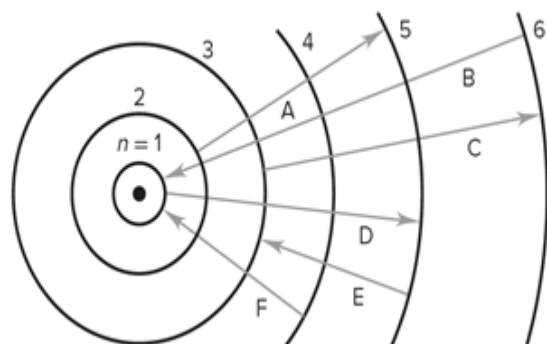


(2) The figure opposite shows Bohr's model of the hydrogen atom with several Electronic transitions indicated by arrows.

(a) Which transitions represent energy Emission and which represent energy absorption?

(b) Which electronic transitions exhibit the Highest energy absorption (A or C) and why?

(c) How much quantum is required for electronic transition (D)?



Question (2):- Mention the scientific reason for each of the following:-

1- Quantum is indivisible and does not multiply.

2- The visible spectrum of hydrogen consists of only four lines.

3- Using a spectrometer, it was determined that hydrogen gas is one of the basic Components of the sun.



Question (3):-

1- Does the corresponding figure represent the visible linear spectrum of a Hydrogen atom?

-Explain the scientific basis for your answer.



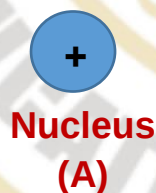
2. "The corresponding Image of a spectrometer used in atomic spectrum analysis"

- Can this device be used to identify the type of element, and why?



3- Study the figures in front of you, which represent the energy levels around the nucleus, then answer the following questions:

Q _____
P _____
N _____
M _____
L _____
K _____



Q _____
P _____
O _____
N _____
M _____
L _____
K _____



- 1- Which of the above figures represents Bohr's calculations of the energy Differences between levels as we move away from the nucleus, and why?
- 2- According to your choice in the first question, which quantum has a higher Value: the quantum required transferring an electron from the first level to the Second Level, or the quantum released by the transfer of an electron from the Fourth level to the third level?
- 3- What is the relationship between the energy of a given level and its radius?



Home performance (Week 7)

Q1/ Choose the correct answer:-

1- All the following are characteristics of electrons, except

- (a) They are material particles.
- (b) They have wave properties.
- (c) They lose energy when they move from one energy level to another.
- (d) They are affected by electric and magnetic fields.

2- Heisenberg's uncertainty principle applies to.....

- (a) Protons.
- (b) Neutrons.
- (c) Electrons.
- (d) All atomic particles.

3- Which of the following choices is saturated with the largest number of electrons?

- (a) orbital of 4f sublevel
- (b) 2P sublevel
- (c) Energy level (n=2)
- (d) 3d sublevel

4. Which of the following formulae can be used to calculate the number of electrons needed to fill the subshell?

- (a) n^2
- (b) $2n^2$
- (c) $2(2\ell+1)$
- (d) $(2\ell+1)$

5-Which of the following choices expresses the four quantum numbers of an electron in the 2Py orbital?

choices	n	ℓ	$m\ell$	m_s
a	2	1	-1	+1/2 or -1/2
b	1	1	0	+1/2 or -1/2
c	2	2	+1	+1/2 or -1/2
d	2	1	0	+1/2 or -1/2

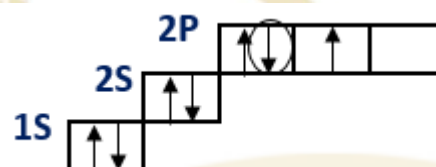


6- Which of the following choices equals the number of orbitals that can be occupied by an electron with principal quantum number ($n=5$) and magnetic quantum number ($m_l = -2$)?

- (a) 1
- (b) 2
- (c) 3
- (d) 4

7- Which of the following choices represents the four quantum numbers for the electron in the circle?

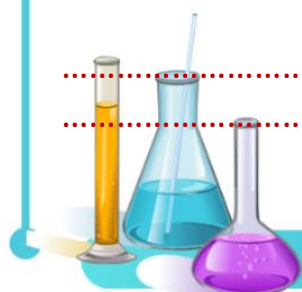
choices	n	ℓ	m_ℓ	m_s
a	1	0	-1	-1/2
b	2	1	-1	-1/2
c	2	1	+1	-1/2
d	2	1	1	+1/2



8- Which of the following choices does not describe the electron cloud and orbital?

choices	Orbital	Electron cloud
a	The region of space surrounding the nucleus where electrons are most likely to be found 90% to 95% The region of	An area of a region of space surrounding the nucleus where electrons are likely to be found.
b	It has a specific shape and size.	It has a specific shape and size It has no clear and specific boundaries and represents the total distribution of electron density
c	It is part of the electron cloud	It is the sum of all orbitals at an energy level
d	It represents a low probability of the electron being present in a wide range	It represents the highest probability density of the electron being present.

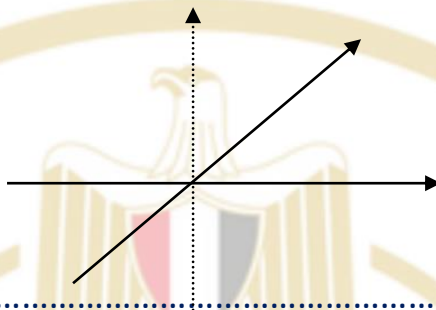




Weekly assessment (Week-7)

Question (1):-

1- The following figure represents three dimensions (X, Y, Z). Draw the orbital - shapes in the main plane (n=2).



2- Complete the following table:

n	ℓ	$m\ell$	m_s	Orbital
2	1	-1	+1/2	2P ☐ ☐ ☐ (example)
1	.....	.....	-1/2	1S ☐
4	3	.....	.....	..... ☐ ☐ ☐ ☐ ☐ ☐
3	.....	-2	+1/2	 ☐ ☐ ☐ ☐ ☐

3- Which one is saturated with a greater number of electrons, energy level (P) or energy level (p)? Why?

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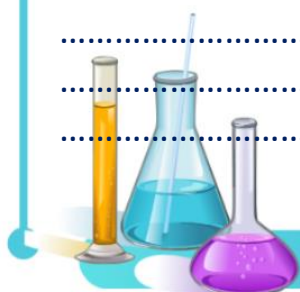
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Question (2):- State the scientific reason for each of the following:

1- The rule $2n^2$ does not apply to levels after the fourth.

.....

.....

.....

2- The f sublevel is filled with 14 electrons.

.....

.....

.....

3- There is no (2d) sublevel in the atom.

.....

.....

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4- The number of electrons required to fill the principle level can be calculated using the $2n^2$ rule.

.....

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Question 3:

1- Write the possible values for Each (ℓ and $m\ell$) for electron (n) = 3.

.....

.....

.....

2- Compare the second and third main energy levels in terms of:

- (a) Their symbols
- (b) The number of electrons needed to saturate each
- (c) Their sublevels
- (d) The number of orbitals in each
- (e) Their radius
- (f) Their energy

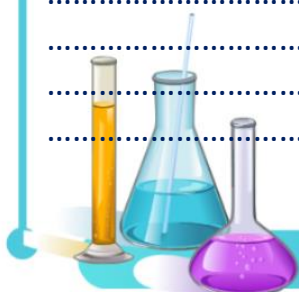
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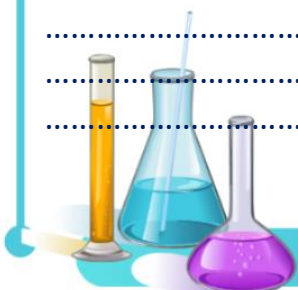
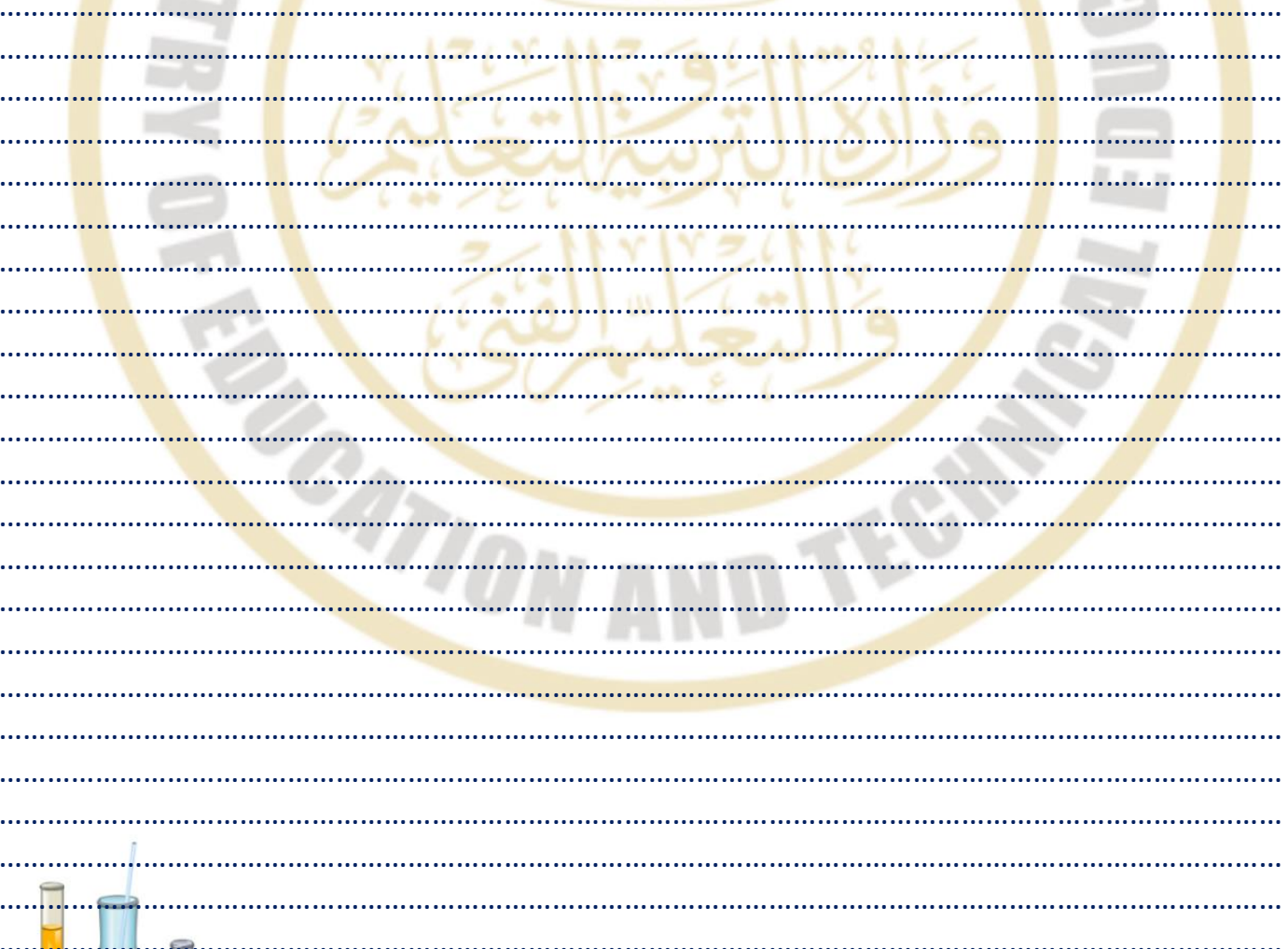
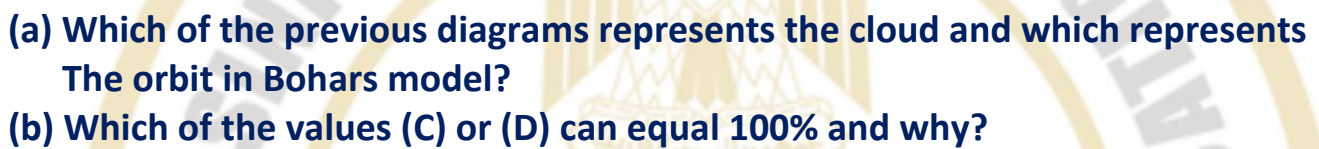
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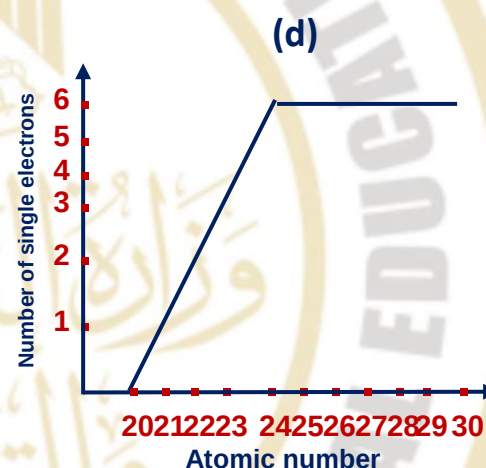
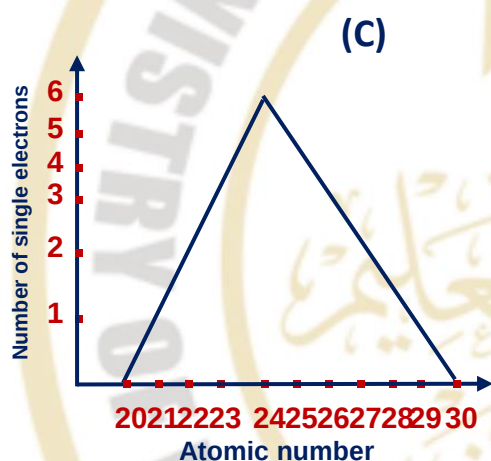
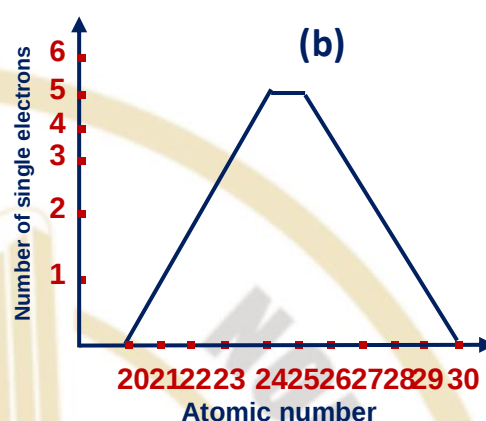
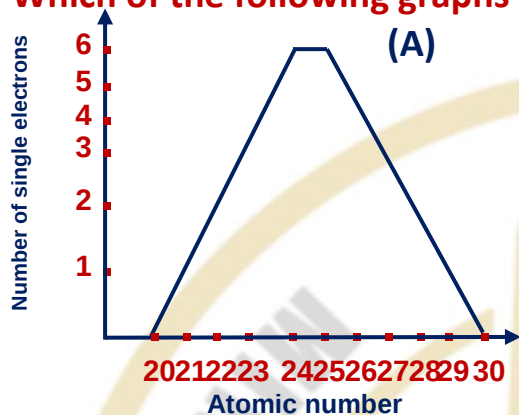




Home performance (Week 8)

Q1/ Choose the correct answer:-

1-Which of the following graphs is correct?

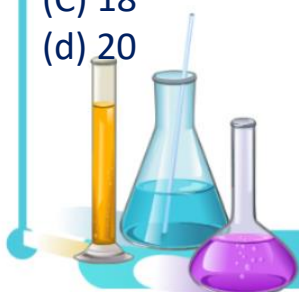


2- An element (X) contains number of electrons in sublevel (4s) equal to number of electrons in (3d), so the electronic configuration of (X^{2+}) is:

- (a) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^2$
- (b) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2$
- (c) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^2$
- (d) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6$

3- The element in which all its electrons are distributed in six completed energy sublevels, its atomic number =

- (a) 1
- (b) 10
- (c) 18
- (d) 20



4- Atom of an element contain one single electron in (p) sublevel, so its atomic number equal

- (a) 12 or 15
- (b) 31 or 17
- (C) 14 or 15
- (d) 11 or 14

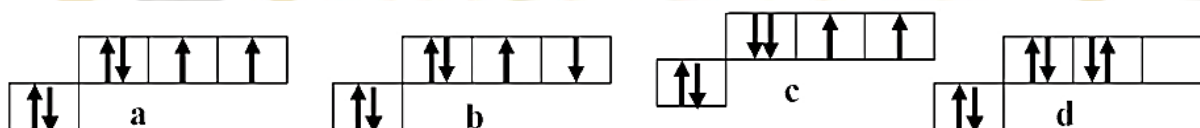
5-The four quantum numbers of the last electron in an atom ($n=3$, $\ell=2$, $m\ell = -2$, $m_s = +1/2$) so its atomic number :

- (a) 11
- (b) 17
- (C) 21
- (d) 26

6-Which of the following represents the number of orbitals partially filled with electrons for an element with atomic number 19?

- (a) 1
- (b) 7
- (c) 10
- (d) 15

7-Which of the following diagram shows the correct distribution of electrons in the last energy level of oxygen atom?



8- If you know that the sum of spin quantum numbers of electrons of an Element = 3, then the atomic number of the element is.....

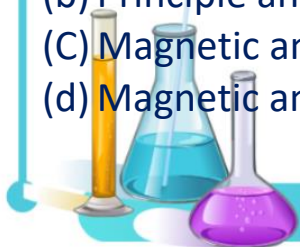
- (a) 24
- (b) 25
- (C) 26
- (d) 27

9- Electronic distribution of (X^{1+}) ion whose nucleus contains 29 protons:

- (a) $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $3d^9$
- (b) $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $4s^2$, $3d^8$
- (C) $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $3d^{10}$
- (d) $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $4s^1$, $3d^{10}$

10- What are the quantum numbers whose value never be negative?

- (a) Principle and subsidiary
- (b) Principle and spin
- (C) Magnetic and subsidiary
- (d) Magnetic and spin



Weekly assessment (Week-8)

Question (1):- State the scientific reason for each of the following:

1- The (s) subshell fills with electrons before (d) subshell, even though it is Farther from the nucleus.

.....

2-Electrons prefer to singularly distribute in the orbitals of the same sublevel first.

.....

3- The paired electrons in the same orbital don't repel in although their same Negative charge.

.....

4- Although the values of $(n + \ell)$ for both subshells (4p) and (3d) are equal, the Energy of (4p) is higher.

.....

5- The element chromium (${}_{24}\text{Cr}$) has an abnormal electron distribution.

.....

6- The copper element (${}_{29}\text{Cu}$) has an abnormal electron distribution.

.....

Question (2):

1- An element its third energy level contains numbers of electrons equals the sum of electrons in first and second energy levels.

-Apply Pauli Exclusion Principle on valences electrons.

.....

2- The four quantum numbers for the valance electron of an atom are $(n = 4, \ell = 0, m_\ell = 0, m_s = -1/2)$, and The number of electrons in the third energy level is the sum of the number of electrons in the first and second energy levels. Write the Electronic configuration for this element and for its $2+$ ion.

.....

.....



3- Determine the possible four quantum numbers of the furthest electrons in scandium atom $_{21}\text{Sc}$.

.....

.....

4 - An element contains one electron in the last sublevel , if the quantum numbers of that electron are : ($n = 3$, $\ell = 1$, $m_\ell = -1$, $m_s = +\frac{1}{2}$) .

-Calculate the atomic number of the element.

.....

.....

Question (5) Choose the correct answer :

1- What is the number of the electrons which have magnetic quantum number $m_\ell = 0$ in cobalt (II) ion $_{27}\text{Co}^{2+}$?

- (a) $7 e^-$
- (b) $8 e^-$
- (c) $10 e^-$
- (d) $11 e^-$

2- The total number of the orbitals which are filled with electrons in the two energy levels (M + L) of the atom of argon $_{18}\text{Ar}$ is

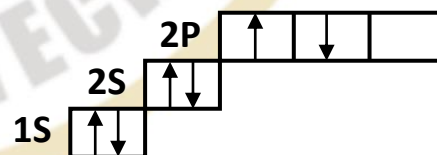
- (a) 4
- (b) 8
- (c) 9
- (d) 13

3- The number of half-filled orbitals in the element whose atomic number (42) = ...

- (a) 4
- (b) 6
- (c) 2
- (d) 5

4- What is the incorrect about this orbital diagram?

- (a) Both arrows in the 2P box should be pointing up
- (b) There is nothing incorrect with this diagram
- (c) In the 2P box there should be 2 electrons in the first box
- (d) All the arrows should be pointing up



5- The number of electrons of an atom in a certain element containing first four full-filled Sublevels and one half filled Sublevel equals

- (a) 7
- (b) 10
- (c) 15
- (d) 18



كيفية طباعة صفحات معينة من ملف معين مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9

